

Project Manual
for the
HURD FIELD RENOVATIONS
TOWN OF ARLINGTON

Recreation Department
422 Summer Street
Arlington, MA 02474

Bid Set
Bid # 22-32

June 16th, 2022

Prepared by



STANTEC PLANNING AND LANDSCAPE ARCHITECTURE
226 Causeway Street, 6th Floor
Boston, Massachusetts 02114
(617) 523-8103

**TOWN OF ARLINGTON
MASSACHUSETTS**

INVITATION FOR BIDS

BID # 22-32 HURD FIELD RENOVATIONS

The Town of Arlington will be soliciting bids for the construction of renovating and existing athletic field under MGL 30, 39M. This will be a prevailing wage project. The project includes, but is not limited to, striping, amending, re-grading existing site, sodding, installing drainage and irrigation, upgrades to existing lighting system, installing landscape features including a porous pathway, permeable pavers, and trees/shrubs and meadow restoration seed mix. Bidders' attention is called to the experience criteria for previous natural grass athletic field work (min. of 5 fields, 60,000sf or larger in the last 8 years).

Bid Documents: Available Wednesday, June 15th, 2022 @ 11am via electronic pdf transfer. Contact Arlington's Purchasing Officer, Domenic Lanzillotti 781-316-3003, dlanzillotti@town.arlington.ma.us.

Bid Due Date: Sealed bids for Hurd Field Renovations will be received at the Purchasing Department, 730 Massachusetts Avenue, Arlington, MA 02476 until 10:00 AM prevailing time, on Wednesday June 29th, 2022 at which time and place said bids will be publicly opened and read aloud.

All bids must be in a sealed envelope plainly marked: **BID No. 22-32 HURD FIELD RENOVATIONS.**

Direct all project questions to Josh Atkinson from Stantec at 857-210-7161 or via email to josh.atkinson@stantec.com, with Domenic Lanzillotti CC'd on the email, dlanzillotti@town.arlington.ma.us.

By-Law of the Town of Arlington, Title 1, Article 16, Minority/Woman Workforce Participation in Construction Projects which exceeds \$200,000.00 is part and parcel of the bid.

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FORMS & GENERAL CONDITIONS

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 IDENTIFICATION

- A. Awarding Authority: Town of Arlington Recreation Department
1. Address: 730 Massachusetts Avenue, Arlington, MA 02476
 2. Contact: Domenic Lanzillotti, Purchasing Department
 3. Telephone: (781) 316-3003
 4. Email: dlanzillotti@town.arlington.ma.us
- B. Owners Representatives: Stantec Planning and Landscape Architecture
1. Address: 226 Causeway Street, 6th floor, Boston MA 02114
 2. Telephone: (857) 210-7161
 3. Contact Person: Josh Atkinson, R.L.A.
 4. Email: josh.atkinson@stantec.com

1.02 PRE-BID CONFERENCE

- A. **There will be no Pre-Bid Conference**, however it is highly encouraged to visit the site prior to submitting a bid. Questions arising from site visits shall be directed to the Owner's Representative. Answers to questions will shall be distributed to all bidders in writing.

1.03 GENERAL CONTRACTOR BID DUE DATE

- A. Bid Opening and Disposition: Sealed bids for Hurd Field Renovations will be received at the Purchasing Department, 730 Massachusetts Avenue, Arlington, MA 02476 until **10:00am prevailing time, on Wednesday June 29th, 2022** at which time and place said bids will be publicly opened and read aloud.
- B. The Bids of the three lowest General Bids may not be withdrawn for 30 days (Saturdays, Sundays, and legal holidays excluded) after receipt of General Bids.

1.04 BIDDING DOCUMENTS

- A. Instructions to Bidders: This "Instructions to Bidders" contains important information about bidding procedures and is intended to provide guidance and assistance to bidders. This "Instructions to Bidders" does not change or supersede the provisions of Law or the Contract Documents.
- B. Bid Documents: Bid Documents consist of the electronic pdf transfer of the Contract Drawings and Contract Document Project Manual.
1. Bid Documents will be available on **Wednesday, June 15th, 2022 at 11am**.
 2. General Bidders may obtain electronic PDF copies of the drawings and

project manual and will only be issued in complete sets. The Bidder must sign a waiver form prior to receiving electronic documents.

1.05 BIDDING REQUIREMENTS

- A. Applicable Laws: All bids are subject to all applicable provisions of law including, without limitation, M.G.L. Chapter 149, Sections 44A through 44J, and Chapter 30, Section 39 M, as amended.
- B. Site Visit Recommended: It is recommended that each bidder visit the site of the proposed work and become fully and completely aware of all existing conditions, existing facilities, and the character of the operations to be carried on under the proposed Contract. Each bidder shall make itself fully understand the facilities, physical conditions, and restrictions attending the work under the Contract. Failure to make such examinations will not relieve the bidder from any obligation under the bidder's bid or sub-bid as submitted, nor shall it serve as the basis for change orders or equitable adjustments.
 - 1. Site Visit Time: Prior to the completion and submission of the bidder's bid.
- C. Document Examination: Each bidder shall thoroughly examine and become familiar with the Contract Documents and the Bidding Documents. Failure to make thorough examinations will not relieve the bidder from any obligation under the bidder's bid as submitted, nor shall it serve at the basis for change orders or equitable adjustments.
- D. Questions, Clarifications, and Interpretations: Bidders shall promptly notify the Owner's Representative of questions, ambiguities, inconsistencies, errors, or omissions, which they may discover upon examination of the Contract Documents, the site, and local conditions.
 - 1. Written Request Required: Submit written requests for clarification and interpretation to the Owner's Representative by email.
 - 2. Time Required: Requests for clarifications and interpretations must be received by the Owner's Representative by 4pm on **Wednesday, June 22, 2022**.
 - 3. Awarding Authority's Response, Addenda: The Awarding Authority's response will be in the form of written Addenda, which shall become part of the Contract Documents. Clarifications and interpretations offered by the Awarding Authority in any form other than formal, written Addenda shall be invalid.
 - 4. Issuance of Addenda: Addenda will be issued to every bidder on record as having obtained bid documents. Copies of Addenda will be available at locations where Contract Documents are filed for public inspection as listed in the Advertisement and these Instructions to Bidders.
 - a. All Addenda shall be issued by email with confirmation of receipt

by email only unless otherwise requested by the Bidder.

5. Addenda Must Be Acknowledged: Bidders shall acknowledge Addenda in the spaces provided on the bid forms. Failure of a bidder to acknowledge Addenda in the spaces provided on the bid form may cause rejection of the bid or lead to a protest. Failure of a bidder to receive any addenda shall not relieve it from any obligation under its bid as submitted.

1.06 CONTRACTOR EQUAL OPPORTUNITY EMPLOYMENT

- A. The Town of Arlington supports Contractor's efforts for Equal Opportunity Employment.

1.07 PREPARATION AND SUBMISSION OF BIDS

General Bid Submission: Submit **one (1)** copy of the bid form, bid deposit and all other necessary information outlined in the specifications, in a sealed envelope. Clearly and boldly identify envelope with: 1) **BID No. 22-32 HURD FIELD RENOVATIONS** ; 2) the name of the Awarding Authority; 3) the name, business address, and business telephone number of the bidder. Submit the bid in the following order:

1. General Bid Form
2. Bid Deposit
3. Proof of Financial Credit & Worthiness
 - a. Bidders must submit proof of financial strength and credit worthiness by submitting a Dunn & Bradstreet Information Report (or information equivalent to that contained in a D&B report from another source, including TransUnion, Experian and Equifax or local bank references). The intent of the Owner in requiring this information is to establish two things: (1) the ability of the general contractor to pay their subs and vendors (current financial condition); and (2) their willingness to pay them (historically). Bidders who do not submit this financial and credit information will be deemed to be non-responsive and will be rejected.
4. Signed and executed Section 00 45 19, Certificate of Non Collusion
5. Signed and executed Section 00 45 43, Affidavit of Compliance and Vote of Corporation.
6. Signed and executed Section 00 43 28, Statement of State Tax Compliance.
7. Signed and executed Section 00 45 46 OSHA Certification.
8. For Contractors and contracts over \$100,000, signed and executed Statement of Management of Internal Accounting Controls and a statement prepared by a Massachusetts Certified Public Accountant expressing an opinion about the State of Management controls, as required by M.G.L., Chapter 30, Section 39R.
9. Athletic Field Construction information as outlined in the specifications

- B. Completion of Bid Forms: Use only the Bid Forms furnished with the bidding documents by the Authority. If additional forms are needed, the Bidder may request to be sent an additional form via email by the Owner's Representative. Complete Bid Forms with typewriter or hand printed in ink.
- C. Alterations Not Permitted: Do not alter bid forms. Do not include any recapitulation of the work to be done. Do not provide any information not requested. Do not strike out, line out, white out, or erase any information.
- D. Amounts: Express amounts in both words and numbers where space for both is provided. In cases of conflict, written amounts shall control over numbers.
- E. Blanks: Complete all spaces provided. Do not leave any blanks. Print "N/A" in any space not needed or used.
- F. Bid Withdrawal: Any bid may be withdrawn by email request, mailed written request, or faxed request prior to date and time of receipt of bids. Withdrawn bids may be resubmitted until date and time of receipt of bids.
 - 1. Email Request: Bid withdrawal by email shall be confirmed in writing with the Bidder's signature.
 - 2. Mailed Written Request: Bid withdrawal by mail shall be in writing and shall be post-marked on or before the date and time of receipt of bids.
 - 3. Modifications: No written, oral, telephone or telegraphic modifications to bids will be considered after the bid is received.
 - 4. Bid Deposits of Withdrawn Bids: The bid deposit will be returned if bids are withdrawn before date and time of receipt of bids.
- G. Bid Deposit (Bid Security): A Bid Deposit (Bid Security) is required for each General Bid in the amount of 5% of the total bid amount including all possible add alternates.
 - 1. Form of Bid Deposit: Bid Deposit shall be made payable to the Awarding Authority and shall be in the form of cash, certified check, issued by a responsible bank or trust company, or a bid bond issued by a surety company licensed to do business in the Commonwealth of Massachusetts. Form of bid bond shall be similar to AIA A310 and must be acceptable to the Awarding Authority.
 - 2. Bid Deposit Return: Bid deposits except those of the three lowest responsible and eligible bidders, will be returned within 10 days after the opening of the bids. The bid deposits of the three lowest responsible and eligible bidders will be returned upon execution of the contract (including delivery of contract, required bond and evidence of insurance to the awarding authority) or at the expiration of thirty (30) days after opening the bids if no award is made; except that, if any bidder fails to perform his/her agreement to execute a contract and furnish the required bond or

security deposit, his/her bid deposit shall become and be the property of the Town of Arlington as liquidated damages.

1.08 PERFORMANCE AND PAYMENT BONDS

- A. Performance and Payment Bonds: The General Bidder selected as General Contractor shall furnish the Awarding Authority with a Performance Bond and a Labor and Materials Payment Bond in the full amount of the Contract Price including possible add alternates. Bonds shall be issued by a surety company that is licensed to do business in the Commonwealth of Massachusetts, State Division of Insurance. Bond form shall be bound in the Project Manual or other form approved by the Awarding Authority.
 - 1. Changes in Contract Price: Whenever the Contract Price is adjusted by Change Order, the General Contractor shall adjust the amount of both the Performance Bond and a Labor and Materials Payment Bond to the new full amount of the Contract Price. The cost of this adjustment shall be included in the General Contractor's mark-up on Change Orders.
- B. Bond Cost: All Performance Bond and Labor and Materials Payment Bond costs, shall be included in the Bid Amount and all premiums for bonds shall be paid by the General Contractor.
- C. Additional Bond Documents Required: With each bond provide certified power of attorney or other certificate of authority where bond is executed by an agent, officer, or other representative of Contractor or surety.

1.09 TAX EXEMPTION

- A. Taxes: The Awarding Authority is exempt from payment of Massachusetts Sales Tax and United States Taxes.
- B. Awarding Authorities Sales Tax Exemption Number: Will be provided to successful bidder upon the bidder's request.
- C. Copies of Receipts Required: In compliance with IRS regulations, the Contractor shall provide the Awarding Authority with copies of all receipts for materials and products used for this Contract purchased using Awarding Authority's Tax Exemption Number.

1.10 CONTRACT AWARD INFORMATION

- A. General Bids May Be Rejected: The Awarding Authority reserves the right to waive informalities in any or all bids; to reject any or all bids; to revise the Contract Documents and re-bid, if it is in the public interest to do so.
- B. Definition of "Lowest Responsible and Eligible Bidder": The "lowest responsible and eligible bidder" means the General Bidder whose bid is the lowest of those General Bidders who demonstrably possess the skill, ability, and integrity necessary for faithful performance of the work, and who certify that they are able

to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

- C. Contract Award: The Contract will be awarded within 30 days after receipt of General Bids (Saturdays, Sundays, and legal holidays excluded) to the lowest responsible and eligible bidder, except in the event of substitution as provided under M.G.L. Chapter 149, Section 44E and 44F, in which case the procedure as required by these Sections of Law shall govern the award of the Contract. No bid shall be considered accepted until the Awarding Authority has issued a written Notice of Award sent by mail or delivered to the address given by the successful bidder on its bid form.
- D. Alternates: It is the sole discretion of the Awarding Authority as to choosing to award the alternates. These alternates will be awarded based on price and may only be awarded in the order as in the specifications per Massachusetts General Laws. Low-bidder shall be determined by the sum of total price of the lump sum price and the alternates chosen by the Awarding Authority. If no alternates are chosen the award will be based on the lump sum price.
- E. Form of Agreement: An example Form of Owner/Contractor Agreement is included in the bidding documents.
- F. Documents Required at Contract Signing: Four copies of each of the following documents are required prior to Contract Signing.
 - 1. Signed and executed Section 00 43 28, Statement of State Tax Compliance.
 - 2. Signed and executed Section 00 61 13.13, Performance Bonds
 - 3. Signed and executed Section 00 61 13.16, Labor and Material Payment Bonds including Power-of -Attorney for the General Contractor.
 - 4. Signed and executed Insurance Certificates for the General Contractor.
 - 5. Signed and executed Form of Sub-Contractor's Equal Employment Certification.

1.11 LIQUIDATED DAMAGES

- A. For the purposes of Liquidated Damages, the "date of completion" shall correspond as follows:
 - 1. For the field area, the date of sod completion as outlined in the Projected Contract Timeline below will be considered as the date of completion in terms of Liquidated Damages.
- B. If the Contractor fails to satisfactorily complete the work on or before the date of completion fixed herein or as duly extended by written certification of the Owner, the Contractor agrees that the Town of Arlington shall deduct from the payments due the Contractor each month the sum of \$250.00 for each calendar day of delay which sum is agreed upon not as a penalty, but as fixed and liquidated damages for each day of such delay. If after 14 calendar days from the date of completion, the Contractor fails to satisfactorily complete the work, the

Contractor agrees that the Town of Arlington shall deduct from the payments due the Contractor each month the sum of \$500.00 for each calendar day of delay which sum is agreed upon not as a penalty, but as a fixed and liquidated damages for each day of such delay. If the payments due the Contractor are less than the amount of such liquidated damages, said damages shall be deducted from any other moneys due or to become due the Contractor, and, in case such damages shall exceed the amount of all moneys due or to become due the Contractor, the Contractor or his Surety shall pay the balance to the Town of Arlington.

1.12 PROJECTED CONTRACT TIMELINE

- A. The contract timeline mobilization date may depend on weather. However, if delays occur, this contract timeline will be adjusted to acknowledge those delays.
- B. Contract Time: The following is a breakdown of contract milestones concerning work for the project:

Monday August 15th, 2022: Contractor to mobilize and work may begin.

Monday, October 24th, 2022: All paving work shall be completed.

Friday, November 4th, 2022: All sodding and associated irrigation work shall be completed.

Substantial Completion shall be granted after 10 mowings (assumes 2 per week) following turf grass establishment. Refer to Athletic Field Specification.

Final Completion shall be dependent on final inspection to turf grass per the Athletic Field Specifications, meadow restoration seed mix establishment, and plantings.

END OF SECTION

SECTION 00 41 00
FORM FOR GENERAL BID

From: (Insert name of General Bidder) _____

To the Owner:

- A. The undersigned proposes to furnish all labor and materials required for the **BID No. 22-32 HURD FIELD RENOVATIONS**, in accordance with the accompanying Contract Documents prepared by the Town of Lincoln for the contract price specified below, subject to additions and deductions according to the terms of the specifications.
- B. This bid includes addenda numbered _____
- C. The proposed Base Bid contract price broken down by phase is: (Bidder: insert words and numbers. In cases of conflict between words and numbers, the words shall control.)

BASE BID CONTRACT LUMP SUM PRICE:

words _____

numbers (\$ _____)

Broken down by as follows, including overhead and profit:

General Conditions

Miscellaneous General Conditions	_____	dollars (\$)
Performance Bond	_____	dollars (\$)
Payment Bond	_____	dollars (\$)
Insurance	_____	dollars (\$)

Division 1: General Requirements

Section 01 50 00	Temporary Facilities	_____	dollars (\$)
Section 01 70 00	Project Closeout	_____	dollars (\$)
Section 01 78 29	Record & As-Built Docs	_____	dollars (\$)
Section 01 78 36	Warranties	_____	dollars (\$)

Division 2: Site Work

Section 02 00 00	Site Requirements	_____	dollars (\$)
Section 13 34 16	Bleachers	_____	dollars (\$)
Section 26 00 00	Electrical System	_____	dollars (\$)
Section 31 00 00	Earthwork	_____	dollars (\$)
Section 31 10 00	Site Preparation	_____	dollars (\$)
Section 31 25 00	Erosion & Sediment Ctrl	_____	dollars (\$)
Section 31 25 01	SWPPP	_____	dollars (\$)
Section 32 12 17	Porous Asph. Pvmnt.	_____	dollars (\$)
Section 32 13 13	Cement Concrete Paving	_____	dollars (\$)
Section 32 14 14	Permeable Pavers	_____	dollars (\$)
Section 32 15 40	Stone Dust Paving	_____	dollars (\$)

Section 32 16 10	Granite Curb	_____	dollars (\$)
Section 32 18 23	Infield Mix	_____	dollars (\$)
Section 32 18 24	Athletic Fields	_____	dollars (\$)
Section 32 30 00	Site Improvements	_____	dollars (\$)
Section 32 31 00	CLF and Backstop	_____	dollars (\$)
Section 32 40 00	Athletic Equipment	_____	dollars (\$)
Section 32 84 00	Irrigation System	_____	dollars (\$)
Section 32 90 00	Planting	_____	dollars (\$)
Section 32 92 15	Meadow Seeding	_____	dollars (\$)
Section 33 12 13	Water Service Connections	_____	dollars (\$)
Section 33 40 00	Storm Drainage System	_____	dollars (\$)
Section 33 47 26	Bioretention Area	_____	dollars (\$)
Section 34 71 13.13	Wood Guardrail	_____	dollars (\$)

D. Allowances: N/A

E. Alternates: It is the sole discretion of the Awarding Authority as to choosing to award the alternates. These alternates will be awarded based on price and may only be awarded in the order as listed below per Massachusetts General Laws. Low-bidder shall be determined by the sum of total price of the lump sum price and the alternates chosen by the Awarding Authority. If no alternates are chosen the award will be based on the lump sum price as listed above.

Alternate No. 1 – N/A

_____ dollars (\$))

F. Required Reference Information: Include with the bid the Proof of Experience Criteria as outlined in Section 32 18 23.21 ATHLETIC FIELDS.

G. Unit prices may be used for Change Orders as specified in the Instructions to Bidders and Section 00 21 13. The difference in Unit Prices between add and deduct shall not exceed 15%. Prices shall include materials, labor, overhead and profit.

	<u>Description of Work</u>	<u>Unit</u>	<u>Amount to add</u>	<u>Amount to deduct</u>
1.	Bedrock Excavation And Removal	Ton.	\$ _____	\$ _____
2.	Topsoil Excavation	Cu. Yd.	\$ _____	\$ _____
	Including export	Cu. Yd.	\$ _____	\$ _____
3.	Unsuitable Material Excavation	Cu. Yd.	\$ _____	\$ _____
	Including export	Cu. Yd.	\$ _____	\$ _____

	Including replacement with ordinary borrow	Cu. Yd. \$ _____	\$ _____
3.	Ordinary Fill in place	Cu. Yd. \$ _____	\$ _____
4.	Gravel Borrow in place	Cu. Yd. \$ _____	\$ _____
5.	Dense Graded Crushed Stone in place	Cu. Yd. \$ _____	\$ _____
6.	Free Draining Crushed Stone	Cu. Yd. \$ _____	\$ _____

	Project Name	Start Date	Completion Date	Contact Name	Contact Address	Contact Telephone #
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

H. If the Bid is accepted by the Owner, the undersigned agrees to complete the entire work provided to be done under the contract within the time stipulated by the Owner.

- I. The undersigned agrees that for extra work, if any, performed in accordance with the AGREEMENT, he will accept compensation as stipulated therein in full payment for such extra work.

- J. Bidder understands that the Owner reserves the right to reject any and all bids.
- K. The undersigned hereby agrees that he will not withdraw the Bid within sixty (60) consecutive calendar days after the actual date of the opening of Bids and that, if the Owner accepts this Bid, the undersigned will duly execute and acknowledge the required Contract Bonds within 10 days after notification that the AGREEMENT is ready for signature.
- L. Should the undersigned fail to fulfill any of his agreements as here in before set forth, the Owner shall have the right to retain as liquidated damages the amount of the Bid security, which shall become the Owner/s property. If a bid was furnished as bid security, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety.
- M. The Undersigned certifies under penalty of perjury that this Bid is in all respect bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the "person" shall mean natural person, joint venture, partnership, corporation or other business or legal entity.
- N. The undersigned certifies that he is able to furnish labor that can work in harmony with all with all laws and regulations applicable to awards made subject forty-four A.
1. Have been in business under the present name for _____ years.
 2. Ever failed to complete any work awarded? _____(Yes), _____(No). If yes, explain:

 3. Bank Reference: _____.
- O. The Undersigned agrees that, if he selected as General Contractor, he will within five days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority and each in the sum of the contract price, the premiums for which are to be paid by the General Contractor and are included in the contract price.
- P. The Undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A.
- Q. The Undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Date: _____

Name of General Bidder

By _____
Name and Title of Person Signing Bid

Business Address

City and State

Phone/Fax Numbers

Note: This proposal shall bear the written signature of the bidder.

1. If the bidder is an individual, provide residential address if different from business address.
2. If the bidder is a partnership, the proposal must be signed by a partner and provide full names and residential addresses of all partners.
3. If the bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of the corporation, the state of incorporation must be provided, and the corporate seal must be affixed. Provide the state of incorporation and the names of all corporate officers.

If an individual:

Name: _____

Residence: _____

If an individual doing business under a firm name:

Name of Firm: _____

Name of Individual: _____

Business Address: _____

Residence: _____

If a partnership:

Name of Partner: _____

Residence: _____

Name of Partner: _____

Residence: _____

Name of Partner: _____

Residence: _____

If a corporation:

Incorporated in
what State:

President:

Treasurer:

Secretary:

END OF SECTION

SECTION 00 43 28
STATEMENT OF STATE TAX COMPLIANCE

Pursuant to MGL Chapter 62C, Section 49A(b),

I, (insert name and title)_____ authorized signatory
for (insert name of contracting party)_____

Whose principal place of business is at_____ do
hereby certify under pains and penalties of perjury that (insert name of contracting party)
_____ has complied with all laws of the
Commonwealth relating to taxes.

Date: _____

Authorized Signature

END OF SECTION

SECTION 00 43 43
**COMMONWEALTH OF MASSACHUSETTS CONTRACT CLAUSES,
WAGE RATES, LABOR STANDARDS & STATEMENT OF COMPLIANCE**

PART 1 - GENERAL

1.01 GENERAL

- A. All provisions of the Contract Documents shall be subject to all applicable provisions of law, including, without limitation, the Commonwealth of Massachusetts statutes indicated below. The Contractor shall recognize that other duties and obligations are required by statutes, which may not be provided herein, but must be considered and made a part of this Contract. Incorrect citations of statutes in this Section shall not relieve the Contractor of its obligations under law. In case of a conflict between the Contract Documents and applicable statutes, the provisions of the statutes shall govern.

1.02 PROVISIONS INCORPORATED BY REFERENCE

- A. The statutes incorporated by reference include, but are not limited to, the following:

Chapter 30, Section 39Fa-h	(payment to subcontractors)
Chapter 30, Section 39I	(deviations)
Chapter 30, Section 39J	(decision by contracting body)
Chapter 30, Section 39K	(payment to contractors)
Chapter 30, Section 39L	(foreign corporations)
Chapter 30, Section 39M	(equality of materials)
Chapter 30, Section 39N	(subsurface conditions)
Chapter 30, Section 39P	(decisions on interpretations)
Chapter 30, Section 39O	(price adjustments and delays)
Chapter 30, Section 39R b	(six year record keeping)
Chapter 30, Section 39R c	(statement of management)
Chapter 30, Section 39R d	(yearly audit)
Chapter 44, Section 31 c	(auditor's certification)
Chapter 62C, Section 49A b	(tax compliance certification)
Chapter 149, Section 26	(prevailing wage requirements)
Chapter 149, Section 27	(prevailing wage posting at job site)
Chapter 149, Section 34	(8 hour day)
Chapter 149, Section 34A	(workmen's compensation)

And other applicable laws.

1.03 LABOR PROVISIONS

- A. Freedom of Lodging, Boarding, and Trading: Every person employed by the Contractor or Subcontractors in performing the work under this Contract shall lodge, board and trade where and with whom he elects, and it shall not be directly or indirectly required as a condition of employment that an employee shall lodge, board, or trade at a particular place or with a particular person, in

accordance with M.G.L., Chapter 149, Section 25.

- B. Employment Preferences: In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers by the Contractor and Subcontractors, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment, who are veterans as defined in Clause 43 of M.G.L., Chapter 4, Section 7, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, in accordance with M.G.L., Chapter 149, Section 226.
- C. Overtime: No laborer, workman, mechanic, foreman or inspector working in the employment of the Contractor, Subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by this Contract, shall be required or permitted to work any more than eight hours in any one day, or more than forty-eight hours in any one week, except in cases of emergency.
- D. Wage Rates: The minimum rates of wages of be paid mechanics and apprentices, chauffeurs, teamsters and laborers shall be set forth in the schedule of rates of wages determined by the Commissioner of Labor and Industry, which schedule if appended to this Section and made a part of the Contract, in accordance with and subject to the provisions of M.G.L. Chapter 149, Section 26.
 - 1. Wage Determination Schedule: A Wage Determination Schedule, provided to the Owner by governmental authorities, is appended to this Section. The Awarding Authority do not guarantee the accuracy of the schedule, and every bidder and contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.
 - 2. Statement of Compliance: The Contractor and each Subcontractor shall furnish to the Commissioner of Labor and Industries and to the Awarding Authority, within fifteen days after completion of its portion of the work, fully completed and certified copies of the attached "Statement of Compliance" certifying compliance with wage and benefit provisions of M.G.L. Chapter 149, Section 26 and 27. A copy of the "Statement of Compliance" is appended to this Section.
 - 3. Records: Every Contractor and Subcontractor working under the terms of any contract for construction on this project shall file weekly payroll records with the Awarding Authority in the form described in M.G.L. Chapter 149, Section 27B in accordance with M.G.L. Chapter 149, Sections 26 and 27B, and 603 CMR 38.03 (2) k.
- E. Payment Insurance: In accordance with M.G.L. Chapter 149, Section 34A, the Contractor shall, before commencing performance of the Contract, provide by

insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 to all persons to be employed under the Contract, and the Contractor shall continue such insurance in full force and effect during the term of the Contract. Sufficient proof of compliance with this Section must be furnished at the time of execution of this Contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of Contract and shall operate as an immediate termination thereof. The attention of the Contractor is directed to that portion of M.G.L. Chapter 149, Section 34A, which provides that whoever violates any of its provisions shall be punished by a fine of not more than one hundred dollars or by imprisonment for six months, or both; and, in addition, any Contractor who violates any provision of this Section shall be prohibited from contracting, directly or indirectly, with the Commonwealth or any political sub-division thereof for the construction, alternation, demolition, maintenance or repair of, or addition to, any public works or public building for a period of two years from the date of conviction of said violation

- F. Pay for Police Officers: The Contractor shall pay to any reserve police officer employed by him the prevailing rate of wage paid to regular police officers, as required by M.G.L. Chapter 149, Section 34B.

1.04 EQUAL EMPLOYMENT OPPORTUNITY

- A. The Contractor and each Subcontractor shall comply with all applicable Local, State, and Federal laws and regulations regarding equal employment opportunity and with the provisions of the following:
1. Governor's "Executive Order No. 74", dated July 20, 1970, entitled the "Governors Code of Fair Practices", as amended by the Governor's "Executive Order No. 116", dated May 1, 1975.
 2. The Fair Employment Practices Law of the Commonwealth, Chapter 151B of the General Laws of Massachusetts, as amended.
 3. The rules and regulations of the Massachusetts Commission Against Discrimination, as in force at the date of the Contract.
- B. Equal Employment Plan: Implement an effective affirmative action plan to assure equal employment opportunity throughout the performance of work on this project. Do not discriminate against any employee or applicant for employment because of race, color, sex, religion, age, or national origin. Affirmative action equal employment opportunity plan shall apply to, but not be limited to, the following.
1. Employment, upgrading, demotion, or transfer.
 2. Recruitment or recruitment advertising.
 3. Layoff or termination.
 4. Rates of pay or other forms of compensation.
 5. Selection for training, including apprenticeship.

- C. Employment Advertisements: State in all solicitations or advertisements for employees that all qualified applicants will receive consideration for employment without regard to race, color, sex, religion, age, or national origin.
- D. Referral Notices: Direct special effort toward the recruitment of minority workers through unions and through referral agencies representing the minority community.
- E. Advising Labor Unions: Send to each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or worker's representative of the Contractor's commitment to equal employment opportunity.
- F. Posting: Post copies of equal opportunity employment notices in conspicuous places available to employees and applicants for employment and post notices setting forth the provisions of this non-discrimination clause.

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FORM OF STATEMENT OF WAGE RATE COMPLIANCE

Date: _____, 20____

I, (insert name of signatory party) _____

Do hereby state: That I pay or supervise the payment of persons employed by (insert name of Contractor or Subcontractor) _____

On The Town of Arlington – Hurd Field Renovations and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of Sections 26 and 27 of Chapter 149 of the Massachusetts General laws.

Signature: _____

Title: _____

This statement is signed under penalties of perjury as provided for under M.G.L. Chapter 149, Section 27B.

END SECTION



CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

ROSALIN ACOSTA
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Arlington
Contract Number: 22-32 **City/Town:** ARLINGTON
Description of Work: Renovation of Hurd Field as per specifications
Job Location: 25 Drake Road

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2021	\$37.05	\$13.41	\$16.01	\$0.00	\$66.47
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2021	\$37.12	\$13.41	\$16.01	\$0.00	\$66.54
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2021	\$37.24	\$13.41	\$16.01	\$0.00	\$66.66
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.93	\$9.10	\$17.57	\$0.00	\$69.60
	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
	06/01/2023	\$44.93	\$9.10	\$17.57	\$0.00	\$71.60
	12/01/2023	\$46.18	\$9.10	\$17.57	\$0.00	\$72.85
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.93	\$9.10	\$17.57	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	12/01/2020	\$38.10	\$12.80	\$9.45	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.93	\$9.10	\$17.57	\$0.00	\$69.60
	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
	06/01/2023	\$44.93	\$9.10	\$17.57	\$0.00	\$71.60
	12/01/2023	\$46.18	\$9.10	\$17.57	\$0.00	\$72.85
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.93	\$9.10	\$17.57	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00	\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00	\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00	\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00	\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00	\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00	\$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	02/01/2022	\$57.15	\$11.39	\$22.34	\$0.00	\$90.88
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Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Boston

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.58	\$11.39	\$22.34	\$0.00	\$62.31
2	60	\$34.29	\$11.39	\$22.34	\$0.00	\$68.02
3	70	\$40.01	\$11.39	\$22.34	\$0.00	\$73.74
4	80	\$45.72	\$11.39	\$22.34	\$0.00	\$79.45
5	90	\$51.44	\$11.39	\$22.34	\$0.00	\$85.17

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$42.33	\$9.10	\$17.72	\$0.00	\$69.15
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For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$41.18	\$9.10	\$17.72	\$0.00	\$68.00
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For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$41.18	\$9.10	\$17.72	\$0.00	\$68.00
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For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						

CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2022	\$44.53	\$8.68	\$19.97	\$0.00	\$73.18
	09/01/2022	\$45.18	\$8.68	\$19.97	\$0.00	\$73.83
	03/01/2023	\$45.78	\$8.68	\$19.97	\$0.00	\$74.43

Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.27	\$8.68	\$1.73	\$0.00	\$32.68
2	60	\$26.72	\$8.68	\$1.73	\$0.00	\$37.13
3	70	\$31.17	\$8.68	\$14.78	\$0.00	\$54.63
4	75	\$33.40	\$8.68	\$14.78	\$0.00	\$56.86
5	80	\$35.62	\$8.68	\$16.51	\$0.00	\$60.81
6	80	\$35.62	\$8.68	\$16.51	\$0.00	\$60.81
7	90	\$40.08	\$8.68	\$18.24	\$0.00	\$67.00
8	90	\$40.08	\$8.68	\$18.24	\$0.00	\$67.00

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.59	\$8.68	\$1.73	\$0.00	\$33.00
2	60	\$27.11	\$8.68	\$1.73	\$0.00	\$37.52
3	70	\$31.63	\$8.68	\$14.78	\$0.00	\$55.09
4	75	\$33.89	\$8.68	\$14.78	\$0.00	\$57.35
5	80	\$36.14	\$8.68	\$16.51	\$0.00	\$61.33
6	80	\$36.14	\$8.68	\$16.51	\$0.00	\$61.33
7	90	\$40.66	\$8.68	\$18.24	\$0.00	\$67.58
8	90	\$40.66	\$8.68	\$18.24	\$0.00	\$67.58

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$30.45/ 3&4 \$36.57/ 5&6 \$56.36/ 7&8 \$62.54

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME <i>CARPENTERS-ZONE 3 (Wood Frame)</i>	04/01/2022	\$23.66	\$7.21	\$4.80	\$0.00	\$35.67
	04/01/2023	\$24.16	\$7.21	\$4.80	\$0.00	\$36.17
All Aspects of New Wood Frame Work						

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CARPENTER (Wood Frame) - Zone 3
Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$14.20	\$7.21	\$0.00	\$0.00	\$21.41
2	60	\$14.20	\$7.21	\$0.00	\$0.00	\$21.41
3	65	\$15.38	\$7.21	\$0.00	\$0.00	\$22.59
4	70	\$16.56	\$7.21	\$0.00	\$0.00	\$23.77
5	75	\$17.75	\$7.21	\$3.80	\$0.00	\$28.76
6	80	\$18.93	\$7.21	\$3.80	\$0.00	\$29.94
7	85	\$20.11	\$7.21	\$3.80	\$0.00	\$31.12
8	90	\$21.29	\$7.21	\$3.80	\$0.00	\$32.30

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$14.50	\$7.21	\$0.00	\$0.00	\$21.71
2	60	\$14.50	\$7.21	\$0.00	\$0.00	\$21.71
3	65	\$15.70	\$7.21	\$0.00	\$0.00	\$22.91
4	70	\$16.91	\$7.21	\$0.00	\$0.00	\$24.12
5	75	\$18.12	\$7.21	\$3.80	\$0.00	\$29.13
6	80	\$19.33	\$7.21	\$3.80	\$0.00	\$30.34
7	85	\$20.54	\$7.21	\$3.80	\$0.00	\$31.55
8	90	\$21.74	\$7.21	\$3.80	\$0.00	\$32.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$17.86/ 3&4 \$20.22/ 5&6 \$27.57/ 7&8 \$29.94

Apprentice to Journeyworker Ratio:1:5
CEMENT MASONRY/PLASTERING
BRICKLAYERS LOCAL 3 (BOSTON)
01/01/2020
\$49.07
\$12.75
\$22.41
\$0.62
\$84.85
Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)
Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$12.75	\$15.41	\$0.00	\$52.70
2	60	\$29.44	\$12.75	\$17.41	\$0.62	\$60.22
3	65	\$31.90	\$12.75	\$18.41	\$0.62	\$63.68
4	70	\$34.35	\$12.75	\$19.41	\$0.62	\$67.13
5	75	\$36.80	\$12.75	\$20.41	\$0.62	\$70.58
6	80	\$39.26	\$12.75	\$21.41	\$0.62	\$74.04
7	90	\$44.16	\$12.75	\$22.41	\$0.62	\$79.94

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$52.38	\$14.00	\$16.05	\$0.00	\$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$33.69	\$14.00	\$16.05	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2022	\$53.66	\$8.65	\$23.05	\$0.00	\$85.36
	07/01/2022	\$54.86	\$8.65	\$23.05	\$0.00	\$86.56
	01/01/2023	\$56.06	\$8.65	\$23.05	\$0.00	\$87.76
	07/01/2023	\$57.26	\$8.65	\$23.05	\$0.00	\$88.96
	01/01/2024	\$58.46	\$8.65	\$23.05	\$0.00	\$90.16
	07/01/2024	\$59.66	\$8.65	\$23.05	\$0.00	\$91.36
	01/01/2025	\$60.86	\$8.65	\$23.05	\$0.00	\$92.56

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.83	\$8.65	\$0.00	\$0.00	\$35.48
2	55	\$29.51	\$8.65	\$6.27	\$0.00	\$44.43
3	60	\$32.20	\$8.65	\$6.84	\$0.00	\$47.69
4	65	\$34.88	\$8.65	\$7.41	\$0.00	\$50.94
5	70	\$37.56	\$8.65	\$19.63	\$0.00	\$65.84
6	75	\$40.25	\$8.65	\$20.20	\$0.00	\$69.10
7	80	\$42.93	\$8.65	\$20.77	\$0.00	\$72.35
8	90	\$48.29	\$8.65	\$21.91	\$0.00	\$78.85

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.43	\$8.65	\$0.00	\$0.00	\$36.08
2	55	\$30.17	\$8.65	\$6.27	\$0.00	\$45.09
3	60	\$32.92	\$8.65	\$6.84	\$0.00	\$48.41
4	65	\$35.66	\$8.65	\$7.41	\$0.00	\$51.72
5	70	\$38.40	\$8.65	\$19.63	\$0.00	\$66.68
6	75	\$41.15	\$8.65	\$20.20	\$0.00	\$70.00
7	80	\$43.89	\$8.65	\$20.77	\$0.00	\$73.31
8	90	\$49.37	\$8.65	\$21.91	\$0.00	\$79.93

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.33	\$9.10	\$17.57	\$0.00	\$69.00
	12/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
	06/01/2023	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
	12/01/2023	\$45.58	\$9.10	\$17.57	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
	12/01/2022	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
	06/01/2023	\$45.33	\$9.10	\$17.57	\$0.00	\$72.00
	12/01/2023	\$46.58	\$9.10	\$17.57	\$0.00	\$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS <i>LABORERS - ZONE 1</i>	06/01/2022	\$43.08	\$9.10	\$17.57	\$0.00	\$69.75
	12/01/2022	\$44.08	\$9.10	\$17.57	\$0.00	\$70.75
	06/01/2023	\$45.08	\$9.10	\$17.57	\$0.00	\$71.75
	12/01/2023	\$46.33	\$9.10	\$17.57	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 1</i>	06/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
	12/01/2022	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
	06/01/2023	\$45.33	\$9.10	\$17.57	\$0.00	\$72.00
	12/01/2023	\$46.58	\$9.10	\$17.57	\$0.00	\$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$43.08	\$9.10	\$17.57	\$0.00	\$69.75
	12/01/2022	\$44.08	\$9.10	\$17.57	\$0.00	\$70.75
	06/01/2023	\$45.08	\$9.10	\$17.57	\$0.00	\$71.75
	12/01/2023	\$46.33	\$9.10	\$17.57	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.33	\$9.10	\$17.57	\$0.00	\$69.00
	12/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
	06/01/2023	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
	12/01/2023	\$45.58	\$9.10	\$17.57	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>DRAWBRIDGE - SEIU LOCAL 888</i>	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ELECTRICIAN	03/01/2022	\$57.32	\$13.00	\$20.82	\$0.00	\$91.14
<i>ELECTRICIANS LOCAL 103</i>	09/01/2022	\$58.76	\$13.00	\$20.86	\$0.00	\$92.62
	03/01/2023	\$60.43	\$13.00	\$20.91	\$0.00	\$94.34

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.93	\$13.00	\$0.69	\$0.00	\$36.62
2	40	\$22.93	\$13.00	\$0.69	\$0.00	\$36.62
3	45	\$25.79	\$13.00	\$15.62	\$0.00	\$54.41
4	45	\$25.79	\$13.00	\$15.62	\$0.00	\$54.41
5	50	\$28.66	\$13.00	\$16.10	\$0.00	\$57.76
6	55	\$31.53	\$13.00	\$16.58	\$0.00	\$61.11
7	60	\$34.39	\$13.00	\$17.04	\$0.00	\$64.43
8	65	\$37.26	\$13.00	\$17.52	\$0.00	\$67.78
9	70	\$40.12	\$13.00	\$17.98	\$0.00	\$71.10
10	75	\$42.99	\$13.00	\$18.46	\$0.00	\$74.45

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$23.50	\$13.00	\$0.71	\$0.00	\$37.21
2	40	\$23.50	\$13.00	\$0.71	\$0.00	\$37.21
3	45	\$26.44	\$13.00	\$15.64	\$0.00	\$55.08
4	45	\$26.44	\$13.00	\$15.64	\$0.00	\$55.08
5	50	\$29.38	\$13.00	\$16.12	\$0.00	\$58.50
6	55	\$32.32	\$13.00	\$16.60	\$0.00	\$61.92
7	60	\$35.26	\$13.00	\$17.07	\$0.00	\$65.33
8	65	\$38.19	\$13.00	\$17.55	\$0.00	\$68.74
9	70	\$41.13	\$13.00	\$18.01	\$0.00	\$72.14
10	75	\$44.07	\$13.00	\$18.49	\$0.00	\$75.56

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86
<i>ELEVATOR CONSTRUCTORS LOCAL 4</i>						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.81	\$16.03	\$0.00	\$0.00	\$48.84
2	55	\$36.09	\$16.03	\$20.21	\$0.00	\$72.33
3	65	\$42.65	\$16.03	\$20.21	\$0.00	\$78.89
4	70	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
5	80	\$52.50	\$16.03	\$20.21	\$0.00	\$88.74

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2022	\$47.18	\$14.00	\$16.05	\$0.00	\$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2022	\$48.72	\$14.00	\$16.05	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2022	\$23.33	\$14.00	\$16.05	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2022	\$57.32	\$13.00	\$20.82	\$0.00	\$91.14
	09/01/2022	\$58.76	\$13.00	\$20.86	\$0.00	\$92.62
	03/01/2023	\$60.43	\$13.00	\$20.91	\$0.00	\$94.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS LOCAL 103</i>	03/01/2022	\$44.71	\$13.00	\$18.74	\$0.00	\$76.45
	09/01/2022	\$46.42	\$13.00	\$18.87	\$0.00	\$78.29
	03/01/2023	\$48.34	\$13.00	\$19.01	\$0.00	\$80.35
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$41.76	\$14.00	\$16.05	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$24.50	\$9.10	\$17.57	\$0.00	\$51.17
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2022	\$49.93	\$8.68	\$20.27	\$0.00	\$78.88

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.97	\$8.68	\$1.79	\$0.00	\$35.44
2	55	\$27.46	\$8.68	\$1.79	\$0.00	\$37.93
3	60	\$29.96	\$8.68	\$14.90	\$0.00	\$53.54
4	65	\$32.45	\$8.68	\$14.90	\$0.00	\$56.03
5	70	\$34.95	\$8.68	\$16.69	\$0.00	\$60.32
6	75	\$37.45	\$8.68	\$16.69	\$0.00	\$62.82
7	80	\$39.94	\$8.68	\$18.48	\$0.00	\$67.10
8	85	\$42.44	\$8.68	\$18.48	\$0.00	\$69.60

Notes: Steps are 750 hrs.

% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)

Step 1&2 \$32.94/ 3&4 \$39.66/ 5&6 \$60.32/ 7&8 \$67.10

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS OPERATING ENGINEERS LOCAL 4	12/01/2021	\$33.69	\$14.00	\$16.05	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) GLAZIERS LOCAL 35 (ZONE 2)	01/01/2022	\$43.16	\$8.65	\$23.05	\$0.00	\$74.86
	07/01/2022	\$44.36	\$8.65	\$23.05	\$0.00	\$76.06
	01/01/2023	\$45.56	\$8.65	\$23.05	\$0.00	\$77.26
	07/01/2023	\$46.76	\$8.65	\$23.05	\$0.00	\$78.46
	01/01/2024	\$47.96	\$8.65	\$23.05	\$0.00	\$79.66
	07/01/2024	\$49.16	\$8.65	\$23.05	\$0.00	\$80.86
	01/01/2025	\$50.36	\$8.65	\$23.05	\$0.00	\$82.06

Classification

**Effective Date Base Wage Health Pension Supplemental
Unemployment Total Rate**

Apprentice - GLAZIER - Local 35 Zone 2

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.58	\$8.65	\$0.00	\$0.00	\$30.23
2	55	\$23.74	\$8.65	\$6.27	\$0.00	\$38.66
3	60	\$25.90	\$8.65	\$6.84	\$0.00	\$41.39
4	65	\$28.05	\$8.65	\$7.41	\$0.00	\$44.11
5	70	\$30.21	\$8.65	\$19.63	\$0.00	\$58.49
6	75	\$32.37	\$8.65	\$20.20	\$0.00	\$61.22
7	80	\$34.53	\$8.65	\$20.77	\$0.00	\$63.95
8	90	\$38.84	\$8.65	\$21.91	\$0.00	\$69.40

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.18	\$8.65	\$0.00	\$0.00	\$30.83
2	55	\$24.40	\$8.65	\$6.27	\$0.00	\$39.32
3	60	\$26.62	\$8.65	\$6.84	\$0.00	\$42.11
4	65	\$28.83	\$8.65	\$7.41	\$0.00	\$44.89
5	70	\$31.05	\$8.65	\$19.63	\$0.00	\$59.33
6	75	\$33.27	\$8.65	\$20.20	\$0.00	\$62.12
7	80	\$35.49	\$8.65	\$20.77	\$0.00	\$64.91
8	90	\$39.92	\$8.65	\$21.91	\$0.00	\$70.48

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS OPERATING ENGINEERS LOCAL 4	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - OPERATING ENGINEERS - Local 4						
Effective Date - 12/01/2021						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$28.26	\$14.00	\$0.00	\$0.00	\$42.26
2	60	\$30.83	\$14.00	\$16.05	\$0.00	\$60.88
3	65	\$33.40	\$14.00	\$16.05	\$0.00	\$63.45
4	70	\$35.97	\$14.00	\$16.05	\$0.00	\$66.02
5	75	\$38.54	\$14.00	\$16.05	\$0.00	\$68.59
6	80	\$41.10	\$14.00	\$16.05	\$0.00	\$71.15
7	85	\$43.67	\$14.00	\$16.05	\$0.00	\$73.72
8	90	\$46.24	\$14.00	\$16.05	\$0.00	\$76.29
Notes:						
Apprentice to Journeyworker Ratio:1:6						
HVAC (DUCTWORK) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2022	\$53.70	\$13.80	\$25.60	\$2.79	\$95.89
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) <i>ELECTRICIANS LOCAL 103</i>	03/01/2022	\$57.32	\$13.00	\$20.82	\$0.00	\$91.14
	09/01/2022	\$58.76	\$13.00	\$20.86	\$0.00	\$92.62
	03/01/2023	\$60.43	\$13.00	\$20.91	\$0.00	\$94.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2022	\$53.70	\$13.80	\$25.60	\$2.79	\$95.89
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.93	\$9.10	\$17.57	\$0.00	\$69.60
	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
	06/01/2023	\$44.93	\$9.10	\$17.57	\$0.00	\$71.60
	12/01/2023	\$46.18	\$9.10	\$17.57	\$0.00	\$72.85
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.93	\$9.10	\$17.57	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2021	\$51.40	\$13.80	\$17.14	\$0.00	\$82.34
	09/01/2022	\$53.85	\$13.80	\$17.14	\$0.00	\$84.79

Classification			Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston								
Effective Date - 09/01/2021								
Step	percent	Apprentice Base Wage		Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$25.70		\$13.80	\$12.42	\$0.00	\$51.92	
2	60	\$30.84		\$13.80	\$13.36	\$0.00	\$58.00	
3	70	\$35.98		\$13.80	\$14.31	\$0.00	\$64.09	
4	80	\$41.12		\$13.80	\$15.25	\$0.00	\$70.17	
Effective Date - 09/01/2022								
Step	percent	Apprentice Base Wage		Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$26.93		\$13.80	\$12.42	\$0.00	\$53.15	
2	60	\$32.31		\$13.80	\$13.36	\$0.00	\$59.47	
3	70	\$37.70		\$13.80	\$14.31	\$0.00	\$65.81	
4	80	\$43.08		\$13.80	\$15.25	\$0.00	\$72.13	
Notes:								
Steps are 1 year								
Apprentice to Journeyworker Ratio:1:4								
IRONWORKER/WELDER			03/16/2022	\$50.60	\$8.20	\$26.50	\$0.00	\$85.30
IRONWORKERS LOCAL 7 (BOSTON AREA)								
Apprentice - IRONWORKER - Local 7 Boston								
Effective Date - 03/16/2022								
Step	percent	Apprentice Base Wage		Health	Pension	Supplemental Unemployment	Total Rate	
1	60	\$30.36		\$8.20	\$26.50	\$0.00	\$65.06	
2	70	\$35.42		\$8.20	\$26.50	\$0.00	\$70.12	
3	75	\$37.95		\$8.20	\$26.50	\$0.00	\$72.65	
4	80	\$40.48		\$8.20	\$26.50	\$0.00	\$75.18	
5	85	\$43.01		\$8.20	\$26.50	\$0.00	\$77.71	
6	90	\$45.54		\$8.20	\$26.50	\$0.00	\$80.24	
Notes:								
** Structural 1:6; Ornamental 1:4								
Apprentice to Journeyworker Ratio:**								
JACKHAMMER & PAVING BREAKER OPERATOR			06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
LABORERS - ZONE 1			12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
			06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
			12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"								
LABORER			06/01/2022	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
LABORERS - ZONE 1			12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
			06/01/2023	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
			12/01/2023	\$45.43	\$9.10	\$17.57	\$0.00	\$72.10
Issue Date: 06/09/2022 Wage Request Number: 20220609-056 Page 13 of 30								

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
Apprentice - LABORER - Zone 1								
Effective Date - 06/01/2022								
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate		
1	60	\$25.31	\$9.10	\$17.57	\$0.00	\$51.98		
2	70	\$29.53	\$9.10	\$17.57	\$0.00	\$56.20		
3	80	\$33.74	\$9.10	\$17.57	\$0.00	\$60.41		
4	90	\$37.96	\$9.10	\$17.57	\$0.00	\$64.63		
Effective Date - 12/01/2022								
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate		
1	60	\$25.91	\$9.10	\$17.57	\$0.00	\$52.58		
2	70	\$30.23	\$9.10	\$17.57	\$0.00	\$56.90		
3	80	\$34.54	\$9.10	\$17.57	\$0.00	\$61.21		
4	90	\$38.86	\$9.10	\$17.57	\$0.00	\$65.53		
Notes:								
Apprentice to Journeyworker Ratio:1:5								
LABORER (HEAVY & HIGHWAY)			12/01/2021	\$41.18	\$9.10	\$17.57	\$0.00	\$67.85
LABORERS - ZONE 1 (HEAVY & HIGHWAY)								

Apprentice - LABORER (Heavy & Highway) - Zone 1								
Effective Date - 12/01/2021								
Step	percent		Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	60		\$24.71	\$9.10	\$17.57	\$0.00	\$51.38	
2	70		\$28.83	\$9.10	\$17.57	\$0.00	\$55.50	
3	80		\$32.94	\$9.10	\$17.57	\$0.00	\$59.61	
4	90		\$37.06	\$9.10	\$17.57	\$0.00	\$63.73	
Notes:								
Apprentice to Journeyworker Ratio:1:5								
LABORER: CARPENTER TENDER			06/01/2022	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
LABORERS - ZONE 1			12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
			06/01/2023	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
			12/01/2023	\$45.43	\$9.10	\$17.57	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"								
LABORER: CEMENT FINISHER TENDER			06/01/2022	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
LABORERS - ZONE 1			12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
			06/01/2023	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
			12/01/2023	\$45.43	\$9.10	\$17.57	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"								

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.33	\$9.10	\$17.57	\$0.00	\$69.00
	12/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
	06/01/2023	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
	12/01/2023	\$45.58	\$9.10	\$17.57	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	06/01/2024	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
	12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
	06/01/2023	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
	12/01/2023	\$45.43	\$9.10	\$17.57	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
	12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
	06/01/2023	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
	12/01/2023	\$45.43	\$9.10	\$17.57	\$0.00	\$72.10
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2022	\$43.69	\$11.39	\$20.37	\$0.00	\$75.45

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.85	\$11.39	\$20.37	\$0.00	\$53.61
2	60	\$26.21	\$11.39	\$20.37	\$0.00	\$57.97
3	70	\$30.58	\$11.39	\$20.37	\$0.00	\$62.34
4	80	\$34.95	\$11.39	\$20.37	\$0.00	\$66.71
5	90	\$39.32	\$11.39	\$20.37	\$0.00	\$71.08

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASONS,TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2022	\$57.17	\$11.39	\$22.31	\$0.00	\$90.87

Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.59	\$11.39	\$22.31	\$0.00	\$62.29
2	60	\$34.30	\$11.39	\$22.31	\$0.00	\$68.00
3	70	\$40.02	\$11.39	\$22.31	\$0.00	\$73.72
4	80	\$45.74	\$11.39	\$22.31	\$0.00	\$79.44
5	90	\$51.45	\$11.39	\$22.31	\$0.00	\$85.15

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	01/03/2022	\$45.52	\$8.58	\$21.57	\$0.00	\$75.67
	01/02/2023	\$47.27	\$8.58	\$21.57	\$0.00	\$77.42

Apprentice - MILLWRIGHT - Local 1121 Zone 1

Effective Date - 01/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$25.04	\$8.58	\$5.72	\$0.00	\$39.34
2	65	\$29.59	\$8.58	\$17.93	\$0.00	\$56.10
3	75	\$34.14	\$8.58	\$18.98	\$0.00	\$61.70
4	85	\$38.69	\$8.58	\$20.01	\$0.00	\$67.28

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$26.00	\$8.58	\$5.72	\$0.00	\$40.30
2	65	\$30.73	\$8.58	\$17.93	\$0.00	\$57.24
3	75	\$35.45	\$8.58	\$18.98	\$0.00	\$63.01
4	85	\$40.18	\$8.58	\$20.01	\$0.00	\$68.77

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 \$5.72, Step 2 \$6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MORTAR MIXER <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$23.48	\$14.00	\$16.05	\$0.00	\$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$28.44	\$14.00	\$16.05	\$0.00	\$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2022	\$53.66	\$8.65	\$23.05	\$0.00	\$85.36
	07/01/2022	\$54.86	\$8.65	\$23.05	\$0.00	\$86.56
	01/01/2023	\$56.06	\$8.65	\$23.05	\$0.00	\$87.76
	07/01/2023	\$57.26	\$8.65	\$23.05	\$0.00	\$88.96
	01/01/2024	\$58.46	\$8.65	\$23.05	\$0.00	\$90.16
	07/01/2024	\$59.66	\$8.65	\$23.05	\$0.00	\$91.36
	01/01/2025	\$60.86	\$8.65	\$23.05	\$0.00	\$92.56

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.83	\$8.65	\$0.00	\$0.00	\$35.48
2	55	\$29.51	\$8.65	\$6.27	\$0.00	\$44.43
3	60	\$32.20	\$8.65	\$6.84	\$0.00	\$47.69
4	65	\$34.88	\$8.65	\$7.41	\$0.00	\$50.94
5	70	\$37.56	\$8.65	\$19.63	\$0.00	\$65.84
6	75	\$40.25	\$8.65	\$20.20	\$0.00	\$69.10
7	80	\$42.93	\$8.65	\$20.77	\$0.00	\$72.35
8	90	\$48.29	\$8.65	\$21.91	\$0.00	\$78.85

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.43	\$8.65	\$0.00	\$0.00	\$36.08
2	55	\$30.17	\$8.65	\$6.27	\$0.00	\$45.09
3	60	\$32.92	\$8.65	\$6.84	\$0.00	\$48.41
4	65	\$35.66	\$8.65	\$7.41	\$0.00	\$51.72
5	70	\$38.40	\$8.65	\$19.63	\$0.00	\$66.68
6	75	\$41.15	\$8.65	\$20.20	\$0.00	\$70.00
7	80	\$43.89	\$8.65	\$20.77	\$0.00	\$73.31
8	90	\$49.37	\$8.65	\$21.91	\$0.00	\$79.93

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2022	\$44.56	\$8.65	\$23.05	\$0.00	\$76.26
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2022	\$45.76	\$8.65	\$23.05	\$0.00	\$77.46
	01/01/2023	\$46.96	\$8.65	\$23.05	\$0.00	\$78.66
	07/01/2023	\$48.16	\$8.65	\$23.05	\$0.00	\$79.86
	01/01/2024	\$49.36	\$8.65	\$23.05	\$0.00	\$81.06
	07/01/2024	\$50.56	\$8.65	\$23.05	\$0.00	\$82.26
	01/01/2025	\$51.76	\$8.65	\$23.05	\$0.00	\$83.46

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**Effective Date - 01/01/2022**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.28	\$8.65	\$0.00	\$0.00	\$30.93
2	55	\$24.51	\$8.65	\$6.27	\$0.00	\$39.43
3	60	\$26.74	\$8.65	\$6.84	\$0.00	\$42.23
4	65	\$28.96	\$8.65	\$7.41	\$0.00	\$45.02
5	70	\$31.19	\$8.65	\$19.63	\$0.00	\$59.47
6	75	\$33.42	\$8.65	\$20.20	\$0.00	\$62.27
7	80	\$35.65	\$8.65	\$20.77	\$0.00	\$65.07
8	90	\$40.10	\$8.65	\$21.91	\$0.00	\$70.66

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.88	\$8.65	\$0.00	\$0.00	\$31.53
2	55	\$25.17	\$8.65	\$6.27	\$0.00	\$40.09
3	60	\$27.46	\$8.65	\$6.84	\$0.00	\$42.95
4	65	\$29.74	\$8.65	\$7.41	\$0.00	\$45.80
5	70	\$32.03	\$8.65	\$19.63	\$0.00	\$60.31
6	75	\$34.32	\$8.65	\$20.20	\$0.00	\$63.17
7	80	\$36.61	\$8.65	\$20.77	\$0.00	\$66.03
8	90	\$41.18	\$8.65	\$21.91	\$0.00	\$71.74

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)

PAINTERS LOCAL 35 - ZONE 2

01/01/2022	\$42.62	\$8.65	\$23.05	\$0.00	\$74.32
07/01/2022	\$43.82	\$8.65	\$23.05	\$0.00	\$75.52
01/01/2023	\$45.02	\$8.65	\$23.05	\$0.00	\$76.72
07/01/2023	\$46.22	\$8.65	\$23.05	\$0.00	\$77.92
01/01/2024	\$47.42	\$8.65	\$23.05	\$0.00	\$79.12
07/01/2024	\$48.62	\$8.65	\$23.05	\$0.00	\$80.32
01/01/2025	\$49.82	\$8.65	\$23.05	\$0.00	\$81.52

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**Effective Date - 01/01/2022**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.31	\$8.65	\$0.00	\$0.00	\$29.96
2	55	\$23.44	\$8.65	\$6.27	\$0.00	\$38.36
3	60	\$25.57	\$8.65	\$6.84	\$0.00	\$41.06
4	65	\$27.70	\$8.65	\$7.41	\$0.00	\$43.76
5	70	\$29.83	\$8.65	\$19.63	\$0.00	\$58.11
6	75	\$31.97	\$8.65	\$20.20	\$0.00	\$60.82
7	80	\$34.10	\$8.65	\$20.77	\$0.00	\$63.52
8	90	\$38.36	\$8.65	\$21.91	\$0.00	\$68.92

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.91	\$8.65	\$0.00	\$0.00	\$30.56
2	55	\$24.10	\$8.65	\$6.27	\$0.00	\$39.02
3	60	\$26.29	\$8.65	\$6.84	\$0.00	\$41.78
4	65	\$28.48	\$8.65	\$7.41	\$0.00	\$44.54
5	70	\$30.67	\$8.65	\$19.63	\$0.00	\$58.95
6	75	\$32.87	\$8.65	\$20.20	\$0.00	\$61.72
7	80	\$35.06	\$8.65	\$20.77	\$0.00	\$64.48
8	90	\$39.44	\$8.65	\$21.91	\$0.00	\$70.00

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *

* If 30% or more of surfaces to be painted are new construction,
NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 2*

01/01/2022	\$43.16	\$8.65	\$23.05	\$0.00	\$74.86
07/01/2022	\$44.36	\$8.65	\$23.05	\$0.00	\$76.06
01/01/2023	\$45.56	\$8.65	\$23.05	\$0.00	\$77.26
07/01/2023	\$46.76	\$8.65	\$23.05	\$0.00	\$78.46
01/01/2024	\$47.96	\$8.65	\$23.05	\$0.00	\$79.66
07/01/2024	\$49.16	\$8.65	\$23.05	\$0.00	\$80.86
01/01/2025	\$50.36	\$8.65	\$23.05	\$0.00	\$82.06

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**Effective Date - 01/01/2022**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.58	\$8.65	\$0.00	\$0.00	\$30.23
2	55	\$23.74	\$8.65	\$6.27	\$0.00	\$38.66
3	60	\$25.90	\$8.65	\$6.84	\$0.00	\$41.39
4	65	\$28.05	\$8.65	\$7.41	\$0.00	\$44.11
5	70	\$30.21	\$8.65	\$19.63	\$0.00	\$58.49
6	75	\$32.37	\$8.65	\$20.20	\$0.00	\$61.22
7	80	\$34.53	\$8.65	\$20.77	\$0.00	\$63.95
8	90	\$38.84	\$8.65	\$21.91	\$0.00	\$69.40

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.18	\$8.65	\$0.00	\$0.00	\$30.83
2	55	\$24.40	\$8.65	\$6.27	\$0.00	\$39.32
3	60	\$26.62	\$8.65	\$6.84	\$0.00	\$42.11
4	65	\$28.83	\$8.65	\$7.41	\$0.00	\$44.89
5	70	\$31.05	\$8.65	\$19.63	\$0.00	\$59.33
6	75	\$33.27	\$8.65	\$20.20	\$0.00	\$62.12
7	80	\$35.49	\$8.65	\$20.77	\$0.00	\$64.91
8	90	\$39.92	\$8.65	\$21.91	\$0.00	\$70.48

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)

PAINTERS LOCAL 35 - ZONE 2

01/01/2022	\$41.22	\$8.65	\$23.05	\$0.00	\$72.92
07/01/2022	\$42.42	\$8.65	\$23.05	\$0.00	\$74.12
01/01/2023	\$43.62	\$8.65	\$23.05	\$0.00	\$75.32
07/01/2023	\$44.82	\$8.65	\$23.05	\$0.00	\$76.52
01/01/2024	\$46.02	\$8.65	\$23.05	\$0.00	\$77.72
07/01/2024	\$47.22	\$8.65	\$23.05	\$0.00	\$78.92
01/01/2025	\$48.42	\$8.65	\$23.05	\$0.00	\$80.12

Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.61	\$8.65	\$0.00	\$0.00	\$29.26
2	55	\$22.67	\$8.65	\$6.27	\$0.00	\$37.59
3	60	\$24.73	\$8.65	\$6.84	\$0.00	\$40.22
4	65	\$26.79	\$8.65	\$7.41	\$0.00	\$42.85
5	70	\$28.85	\$8.65	\$19.63	\$0.00	\$57.13
6	75	\$30.92	\$8.65	\$20.20	\$0.00	\$59.77
7	80	\$32.98	\$8.65	\$20.77	\$0.00	\$62.40
8	90	\$37.10	\$8.65	\$21.91	\$0.00	\$67.66

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.21	\$8.65	\$0.00	\$0.00	\$29.86
2	55	\$23.33	\$8.65	\$6.27	\$0.00	\$38.25
3	60	\$25.45	\$8.65	\$6.84	\$0.00	\$40.94
4	65	\$27.57	\$8.65	\$7.41	\$0.00	\$43.63
5	70	\$29.69	\$8.65	\$19.63	\$0.00	\$57.97
6	75	\$31.82	\$8.65	\$20.20	\$0.00	\$60.67
7	80	\$33.94	\$8.65	\$20.77	\$0.00	\$63.36
8	90	\$38.18	\$8.65	\$21.91	\$0.00	\$68.74

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/01/2021	\$41.18	\$9.10	\$17.57	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$36.88	\$13.41	\$16.01	\$0.00	\$66.30
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
PILE DRIVER PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$9.40	\$23.12	\$0.00	\$57.06
2	60	\$29.44	\$9.40	\$23.12	\$0.00	\$61.96
3	70	\$34.35	\$9.40	\$23.12	\$0.00	\$66.87
4	75	\$36.80	\$9.40	\$23.12	\$0.00	\$69.32
5	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
6	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
7	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68
8	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$34.01/ 3&4 \$41.46/ 5&6 \$62.80/ 7&8 \$69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
PIPEFITTERS LOCAL 537						

Apprentice - PIPEFITTER - Local 537

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$23.18	\$11.70	\$8.25	\$0.00	\$43.13
2	45	\$26.07	\$11.70	\$20.24	\$0.00	\$58.01
3	60	\$34.76	\$11.70	\$20.24	\$0.00	\$66.70
4	70	\$40.56	\$11.70	\$20.24	\$0.00	\$72.50
5	80	\$46.35	\$11.70	\$20.24	\$0.00	\$78.29

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
LABORERS - ZONE 1						
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35

For apprentice rates see "Apprentice- LABORER"

PIPELAYER (HEAVY & HIGHWAY)	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
LABORERS - ZONE 1 (HEAVY & HIGHWAY)						

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBERS & GASFITTERS <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2022	\$61.79	\$14.07	\$18.36	\$0.00	\$94.22
	09/04/2022	\$63.49	\$14.07	\$18.36	\$0.00	\$95.92
	02/26/2023	\$65.19	\$14.07	\$18.36	\$0.00	\$97.62
	09/03/2023	\$66.94	\$14.07	\$18.36	\$0.00	\$99.37
	03/03/2024	\$68.74	\$14.07	\$18.36	\$0.00	\$101.17
	09/01/2024	\$70.54	\$14.07	\$18.36	\$0.00	\$102.97
	03/02/2025	\$72.34	\$14.07	\$18.36	\$0.00	\$104.77

Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.63	\$14.07	\$6.63	\$0.00	\$42.33
2	40	\$24.72	\$14.07	\$7.52	\$0.00	\$46.31
3	55	\$33.98	\$14.07	\$10.24	\$0.00	\$58.29
4	65	\$40.16	\$14.07	\$12.04	\$0.00	\$66.27
5	75	\$46.34	\$14.07	\$13.85	\$0.00	\$74.26

Effective Date - 09/04/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$22.22	\$14.07	\$6.63	\$0.00	\$42.92
2	40	\$25.40	\$14.07	\$7.52	\$0.00	\$46.99
3	55	\$34.92	\$14.07	\$10.24	\$0.00	\$59.23
4	65	\$41.27	\$14.07	\$12.04	\$0.00	\$67.38
5	75	\$47.62	\$14.07	\$13.85	\$0.00	\$75.54

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$69.00, Step5 with lic\$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35

For apprentice rates see "Apprentice- LABORER"

PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
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For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	06/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
	12/01/2022	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
	06/01/2023	\$45.18	\$9.10	\$17.57	\$0.00	\$71.85
	12/01/2023	\$46.43	\$9.10	\$17.57	\$0.00	\$73.10

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$42.18	\$9.10	\$17.57	\$0.00	\$68.85
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$33.69	\$14.00	\$16.05	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012) <i>TEAMSTERS 25 (Metro) - Aggregate</i>	05/01/2022	\$30.40	\$11.41	\$15.25	\$0.00	\$57.06
	08/01/2022	\$30.40	\$11.91	\$15.25	\$0.00	\$57.56
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 25 (Metro) - Aggregate</i>	05/01/2022	\$34.41	\$11.41	\$15.25	\$0.00	\$61.07
	08/01/2022	\$34.41	\$11.91	\$15.25	\$0.00	\$61.57
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofing Waterproofing &Roofing Dampproofing) <i>ROOFERS LOCAL 33</i>	02/01/2022	\$47.03	\$12.28	\$19.45	\$0.00	\$78.76

Apprentice - ROOFER - Local 33

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.52	\$12.28	\$5.21	\$0.00	\$41.01
2	60	\$28.22	\$12.28	\$19.45	\$0.00	\$59.95
3	65	\$30.57	\$12.28	\$19.45	\$0.00	\$62.30
4	75	\$35.27	\$12.28	\$19.45	\$0.00	\$67.00
5	85	\$39.98	\$12.28	\$19.45	\$0.00	\$71.71

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	02/01/2022	\$47.28	\$12.28	\$19.45	\$0.00	\$79.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2022	\$53.70	\$13.80	\$25.60	\$2.79	\$95.89

Classification

Effective Date

Base Wage

Health

Pension

**Supplemental
Unemployment**

Total Rate

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$22.55	\$13.80	\$6.01	\$0.00	\$42.36
2	42	\$22.55	\$13.80	\$6.01	\$0.00	\$42.36
3	47	\$25.24	\$13.80	\$11.26	\$1.51	\$51.81
4	47	\$25.24	\$13.80	\$11.26	\$1.51	\$51.81
5	52	\$27.92	\$13.80	\$12.23	\$1.62	\$55.57
6	52	\$27.92	\$13.80	\$12.48	\$1.63	\$55.83
7	60	\$32.22	\$13.80	\$13.87	\$1.80	\$61.69
8	65	\$34.91	\$13.80	\$14.84	\$1.91	\$65.46
9	75	\$40.28	\$13.80	\$16.77	\$2.13	\$72.98
10	85	\$45.65	\$13.80	\$18.20	\$2.33	\$79.98

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.34	\$13.41	\$16.01	\$0.00	\$66.76
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.63	\$13.41	\$16.01	\$0.00	\$67.05
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1	03/01/2022	\$64.36	\$10.44	\$22.10	\$0.00	\$96.90
	10/01/2022	\$66.06	\$10.44	\$22.10	\$0.00	\$98.60
	03/01/2023	\$67.76	\$10.44	\$22.10	\$0.00	\$100.30
	10/01/2023	\$69.51	\$10.44	\$22.10	\$0.00	\$102.05
	03/01/2024	\$71.31	\$10.44	\$22.10	\$0.00	\$103.85
	10/01/2024	\$73.11	\$10.44	\$22.10	\$0.00	\$105.65
	03/01/2025	\$74.91	\$10.44	\$22.10	\$0.00	\$107.45

Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1**Effective Date - 03/01/2022**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$22.53	\$10.44	\$12.35	\$0.00	\$45.32
2	40	\$25.74	\$10.44	\$13.10	\$0.00	\$49.28
3	45	\$28.96	\$10.44	\$13.85	\$0.00	\$53.25
4	50	\$32.18	\$10.44	\$14.60	\$0.00	\$57.22
5	55	\$35.40	\$10.44	\$15.35	\$0.00	\$61.19
6	60	\$38.62	\$10.44	\$16.10	\$0.00	\$65.16
7	65	\$41.83	\$10.44	\$16.85	\$0.00	\$69.12
8	70	\$45.05	\$10.44	\$17.60	\$0.00	\$73.09
9	75	\$48.27	\$10.44	\$18.35	\$0.00	\$77.06
10	80	\$51.49	\$10.44	\$19.10	\$0.00	\$81.03

Effective Date - 10/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$23.12	\$10.44	\$12.35	\$0.00	\$45.91
2	40	\$26.42	\$10.44	\$13.10	\$0.00	\$49.96
3	45	\$29.73	\$10.44	\$13.85	\$0.00	\$54.02
4	50	\$33.03	\$10.44	\$14.60	\$0.00	\$58.07
5	55	\$36.33	\$10.44	\$15.35	\$0.00	\$62.12
6	60	\$39.64	\$10.44	\$16.10	\$0.00	\$66.18
7	65	\$42.94	\$10.44	\$16.85	\$0.00	\$70.23
8	70	\$46.24	\$10.44	\$17.60	\$0.00	\$74.28
9	75	\$49.55	\$10.44	\$18.35	\$0.00	\$78.34
10	80	\$52.85	\$10.44	\$19.10	\$0.00	\$82.39

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN OPERATING ENGINEERS LOCAL 4	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 103	03/01/2022	\$44.71	\$13.00	\$18.74	\$0.00	\$76.45
	09/01/2022	\$46.42	\$13.00	\$18.87	\$0.00	\$78.29
	03/01/2023	\$48.34	\$13.00	\$19.01	\$0.00	\$80.35

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$20.12	\$13.00	\$0.60	\$0.00	\$33.72
2	45	\$20.12	\$13.00	\$0.60	\$0.00	\$33.72
3	50	\$22.36	\$13.00	\$15.06	\$0.00	\$50.42
4	50	\$22.36	\$13.00	\$15.06	\$0.00	\$50.42
5	55	\$24.59	\$13.00	\$15.43	\$0.00	\$53.02
6	60	\$26.83	\$13.00	\$15.79	\$0.00	\$55.62
7	65	\$29.06	\$13.00	\$16.16	\$0.00	\$58.22
8	70	\$31.30	\$13.00	\$16.53	\$0.00	\$60.83
9	75	\$33.53	\$13.00	\$16.91	\$0.00	\$63.44
10	80	\$35.77	\$13.00	\$17.27	\$0.00	\$66.04

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$20.89	\$13.00	\$0.63	\$0.00	\$34.52
2	45	\$20.89	\$13.00	\$0.63	\$0.00	\$34.52
3	50	\$23.21	\$13.00	\$15.13	\$0.00	\$51.34
4	50	\$23.21	\$13.00	\$15.13	\$0.00	\$51.34
5	55	\$25.53	\$13.00	\$15.51	\$0.00	\$54.04
6	60	\$27.85	\$13.00	\$15.88	\$0.00	\$56.73
7	65	\$30.17	\$13.00	\$16.26	\$0.00	\$59.43
8	70	\$32.49	\$13.00	\$16.62	\$0.00	\$62.11
9	75	\$34.82	\$13.00	\$17.00	\$0.00	\$64.82
10	80	\$37.14	\$13.00	\$17.37	\$0.00	\$67.51

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	02/01/2022	\$56.09	\$11.39	\$22.34	\$0.00	\$89.82
BRICKLAYERS LOCAL 3 - MARBLE & TILE						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.05	\$11.39	\$22.34	\$0.00	\$61.78
2	60	\$33.65	\$11.39	\$22.34	\$0.00	\$67.38
3	70	\$39.26	\$11.39	\$22.34	\$0.00	\$72.99
4	80	\$44.87	\$11.39	\$22.34	\$0.00	\$78.60
5	90	\$50.48	\$11.39	\$22.34	\$0.00	\$84.21

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$42.58	\$9.10	\$17.72	\$0.00	\$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$41.30	\$9.10	\$17.72	\$0.00	\$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2021	\$41.18	\$9.10	\$17.72	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$50.83	\$14.00	\$16.05	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2021	\$37.92	\$13.41	\$16.01	\$0.00	\$67.34
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2021	\$53.41	\$9.10	\$18.17	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2021	\$55.41	\$9.10	\$18.17	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2021	\$45.48	\$9.10	\$18.17	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2021	\$47.48	\$9.10	\$18.17	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2021	\$37.34	\$13.41	\$16.01	\$0.00	\$66.76
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2022	\$42.43	\$9.10	\$17.57	\$0.00	\$69.10
	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
	06/01/2023	\$44.43	\$9.10	\$17.57	\$0.00	\$71.10
	12/01/2023	\$45.68	\$9.10	\$17.57	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2021	\$41.43	\$9.10	\$17.57	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2021	\$51.38	\$14.00	\$16.05	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2022	\$63.39	\$13.57	\$17.26	\$0.00	\$94.22
	09/04/2022	\$63.49	\$14.07	\$18.36	\$0.00	\$95.92
	02/26/2023	\$65.19	\$14.07	\$18.36	\$0.00	\$97.62
	09/03/2023	\$66.94	\$14.07	\$18.36	\$0.00	\$99.37
	03/03/2024	\$68.74	\$14.07	\$18.36	\$0.00	\$101.17
	09/01/2024	\$70.54	\$14.07	\$18.36	\$0.00	\$102.97
	03/02/2025	\$72.34	\$14.07	\$18.36	\$0.00	\$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 00 45 19
CERTIFICATE OF NON-COLLUSION

Pursuant to MGL Chapter 30, The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Date: _____

Name of Bidder

Title and name of Person Signing Bid

Business Address

City and State

END OF SECTION

SECTION 00 45 43
AFFIDAVIT OF COMPLIANCE AND VOTE OF CORPORATION

_____ Massachusetts Business Corporation _____ Foreign (non-Mass.) Corporation
_____ Non-Profit Corporation

I, _____, President of *(insert corporation name)*

whose principal office is located at _____
do hereby certify that the above named corporation has filed with the Secretary of State all
certificates and annual reports required by Chapter 156B, Section 109 (business corporation), by
Chapter 181, Section 4 (foreign corporation) or by Chapter 180, Section 26A (non-profit corporation)
of the Massachusetts General Laws.

SIGNED UNDER THE PENALTIES OF PERJURY THIS _____ day of _____, _____

Signature of Responsible Corporate Officer

*(If a corporation, complete below or attach to each signed copy of the Contract a notarized copy
of vote of corporation authorizing the signatory to sign this Contract.)*

At a duly authorized meeting of the Board of Directors of the _____
_____ (corporation)
held on the _____ day of _____, _____ at which all the Directors were
present or waived notice, it was VOTED, that, _____ who is the
duly elected _____ of this corporation to be and hereby is
authorized to execute contracts, bonds and other instruments in the name and behalf of said
corporation and affix its corporate seal thereto, and such execution of any contract or other
instrument or obligation in this corporation's name on behalf by such (insert officer's title) _____
_____ of the corporation, shall be valid and binding upon this corporation.

I hereby certify that I am the Clerk of the Corporation and that _____ is
the duly elected _____ of said corporation, and that the above vote
has not been amended or rescinded and remains in full force and effect as of the date of this
contract

A true copy,

ATTEST
Clerk

(Corporate Seal)
Business Address

END OF SECTION

SECTION 00 45 46
OSHA CERTIFICATION

NOTE: The undersigned shall certify that all persons they employ at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least ten (10) hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

Name of Bidder_____

Signature_____Date_____

END OF SECTION

SECTION 00 61 13.13
PERFORMANCE BOND

KNOWN ALL MEN BY THESE PRESENTS that _____

as Principal, and _____

Surety, are held and firmly bound unto the Awarding Authority, in the sum of _____

lawful money of the United States to be paid to the Awarding Authority for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has made a contract with the Awarding Authority bearing the date of

_____ 20____, for the construction of _____

_____ (Project).

Now the condition of this obligation is such that if the Principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said contract and any extensions thereof that may be granted by the Awarding Authority, with or without notice to the Surety, and during the life and any guaranty required under the contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said contract that may hereafter be made, notice to the Surety of such modifications, alterations, changes or additions being hereby waived, then this obligations shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the contract is abandoned by the Contractor, or is terminated by the Awarding Authority, said Surety hereby further agrees that said Surety shall, if requested in writing by the Awarding Authority, take such action as is necessary to complete said Contract.

In witness whereof we hereto set our hands and seal this _____ day of _____, 20____.

By Principal: _____

By Surety: _____

Address: _____

Surety Agent: _____

Address: _____

Telephone: _____

FORM APPROVED BY AWARDED AUTHORITY: _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____ certify that I am the _____
of the corporation names as Principal in the within bond; that _____
who signed said bond on behalf of the Principal was then _____
of said corporation and I know his signature and his signature thereon is genuine; and that said
Bond was duly signed, sealed and attested for and on behalf of said corporation by authority of
its governing body.

Signed: _____ (Seal)

Date: _____, 20____.

Rate of Premium on this bond is \$ _____ per thousand.

Total Amount of Premium Charge is \$ _____.

END OF SECTION

SECTION 00 61 13.16
LABOR AND MATERIALS PAYMENT BOND

KNOWN ALL MEN BY THESE PRESENTS that _____

as Principal, and _____

as Surety, are held and firmly bound unto the Awarding Authority, in the sum of _____

lawful money of the United States to be paid to the Awarding Authority for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has made a contract with the Awarding Authority bearing the date of

_____ 20____, for the construction of _____

_____ (Project).

Now the condition of this obligation is such that if the Principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said contract and any extensions thereof that may be granted by the Awarding Authority, with or without notice to the Surety, and during the life and any guaranty required under the contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said contract that may hereafter be made, notice to the Surety of such modifications, alterations, changes or additions being hereby waived, then this obligations shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the contract is abandoned by the Contractor, or is terminated by the Awarding Authority, said Surety hereby further agrees that said Surety shall, if requested in writing by the Awarding Authority, take such action as is necessary to complete said Contract.

In witness whereof we hereto set our hands and seal this _____ day of _____, 20____.

By Principal: _____

By Surety: _____

Address: _____

Surety Agent: _____

Address: _____

Telephone: _____

FORM APPROVED BY AWARDED AUTHORITY: _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____ certify that I am the _____

of the corporation names as Principal in the within bond; that _____

who signed said bond on behalf of the Principal was then _____

of said corporation and I know his signature and his signature thereon is genuine; and that said Bond was duly signed, sealed and attested for and on behalf of said corporation by authority of its governing body.

Signed: _____ (Seal)

Date: _____, 20____.

Rate of Premium on this bond is \$ _____ per thousand.

Total Amount of Premium Charge is \$ _____.

END OF SECTION

SECTION 00 63 00
CERTIFICATION BY OWNER

Pursuant to General Laws, Chapter 44, Section 31C, I hereby certify that

(insert person's name) _____

the (insert person's title) _____

of the Town of Arlington, Massachusetts has authority to approve all requisitions and change orders on behalf of the Awarding Authority.

TOWN OF LINCOLN

END OF SECTION

SECTION 00 71 16.10
TOWN BOARD AND DEPARTMENT ORDER OF CONDITIONS

PART 1 - GENERAL

1.01 GENERAL

- A. This Project has been permitted by and is under the jurisdiction of Arlington Conservation Commission. The Contractor is responsible for obtaining an official copy of the following conditions from the appropriate parties and for full compliance with all conditions of the orders throughout construction:
 - 1. Arlington Conservation Commission – Order of Conditions for Hurd Field – DEP File Number 091-337.
- B. A copy of the conditions will be provided under separate cover.

END OF SECTION

SECTION 00 73 16
INSURANCE REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

- A. This Section specifies the Owner's insurance requirements and relates to the General Conditions of the Contract for Construction and Supplementary General Conditions of the Contract for Construction.
- B. Provisions of the General Conditions of the Contract for Construction and Supplementary General Conditions of the Contract for Construction which are not modified by the following Insurance Requirements remain in full effect.

1.02 INSURANCE REQUIREMENTS

- A. The insurance required shall be written for not less than the limits of liability required by law or the following limits, whichever is greater:

State and Federal Workmen's Compensation	Statutory
Employer's Liability (Each Accident)	\$ 500,000.00
Benefits Required by Union Contract	As Required
GENERAL LIABILITY*	
General Liability - Bodily Injury Each Occurrence	\$1,000,000.00
General Liability - Bodily Injury Aggregate	\$ 3,000,000.00
General Liability - Property Damage Each Occurrence	\$ 1,000,000.00
General Liability - Property Damage Aggregate	\$ 3,000,000.00

*General Liability shall include coverage for the following:

- Comprehensive Form
- Premises/Operations Liability
- Explosion, Collapse and Underground (XCU)
- Products/Completed Operations
- Contractual Liability
- Independent Contractors
- Broad Form Property Damage
- Personal Injury including Libel and Slander Coverage
- Broad Form CGL Endorsement

AUTOMOBILE LIABILITY**

Comp. Automobile Liability** - Bodily Injury Per Person	\$ 500,000.00
Comp. Automobile Liability** - Bodily Injury Per Accident	\$ 1,000,000.00
Comp. Automobile Liability** - Property Damage	\$ 500,000.00

**Provide coverage for all Owned, Non-Owned, and Hired Vehicles.

EXCESS LIABILITY (UMBRELLA COVERAGE)

Bodily Injury and Property Damage Combined Aggregate	\$ 3,000,000.00
--	-----------------

- B. Exclusions: The Owner's property insurance shall not cover tools, equipment, shoring, staging, forms, temporary buildings or other equipment owned or rented by the Contractor, its Subcontractors, or any worker.

- C. Insurance Certificates: The Contractor and all Subcontractors who are required to provide insurance under the Contract shall provide accurate and bona fide "Certificates of Insurance" issued by a responsible agent of the insurance company.
1. Certificate Content: Such "Certificates of Insurance" shall clearly indicate the insurance coverage provided including all riders and limits specified. Each "Certificates of Insurance" shall be accompanied by a sworn and duly notarized statement from the responsible agent of the insurance company issuing the Certificate clearly stating that all insurance specified and required by the Contract Documents is provided and in force, and also a clear statement of all exceptions and deviations, if any, from the Contract Document insurance requirements.
 2. Responsibility: The insurance agent issuing and authorizing the "Certificates of Insurance" shall be responsible and liable for the accuracy and validity of the "Certificates of Insurance". Each insured party shall certify by sworn and duly notarized statement that the "Certificates of Insurance" issued for them are bona fide.
 3. Disclaimers Prohibited: "Certificates of Insurance" shall not contain any disclaimers such as: "This Certificate is issued as a matter of information only and confers no rights upon the certificate holder. This Certificate does not amend, extend, or alter the coverage afforded by the policies listed below." Disclaimers are not accepted.
 4. Certificates of Insurance can be Relied Upon: Parties receiving "Certificates of Insurance" shall be entitled to rely upon the "Certificates of Insurance" and shall have the right to claim the benefits and protection provided by the insurance as it applies to them.
 5. Alternate to "Certificates of Insurance": Instead of providing the "Certificates of Insurance" and the sworn statements required above, the insured may provide bona fide and accurate copies of all insurance policies and riders accompanied by a sworn and duly notarized statement from the insured that the policies, riders, and documents submitted are bona fide and valid, and that parties receiving the insurance documents may rely on the documents as satisfied of the Contract insurance requirements.

END OF SECTION

BY-LAWS OF THE TOWN OF ARLINGTON
TITLE I
ARTICLE 16

CONSTRUCTION PROJECTS

Section 1. Women Work Force Participation

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

- A. Contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract, if applicable. The preceding sentence shall be included in all construction contracts whether entered into by the Town pursuant to the provisions of M.G.L. c. 149 or M.G. L. c 30, §39M et. seq. provided however, that if entered into under Chapter 30 same shall not be deemed to apply where the projected bid price as determined by the Director of Public Works is not likely to exceed \$200,000.
- B. A Labor Scheduling Table which will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract.

Section 2. Equal Opportunity Goal Compliance

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

- A. Before starting work, the contractors (includes the general contractor, for itself and its subcontractors, as well as all filed sub-bid contractors, if applicable) will submit plans for achievement of the equal opportunity goals of the contract. All contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the contractors expect to achieve the requirements during the first quarter. If there are reasons why the contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the contractors shall provide a plan calculated to address, to the extent reasonably possibly, these obstacles to a good faith effort to achieve such goals.
- B. Not more than ten days following the end of each work quarter, the contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.
- C. All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.

Section 3. Recruitment and Training

Any board, officer, committee, or other agency of the Town, which acts on behalf of the Town in making or supervising any contract, in an amount exceeding the sum of \$100,000 for the purchase of goods or services or for the construction, renovation, or repair of buildings or other improvement of real estate, may make arrangements with contractors and other interested agencies for special programs of recruitment and training in connection with the work to be performed on such contract, with the objective of promoting equal employment opportunity for members of minority groups protected by the fair employment laws of the Commonwealth and the United States. Any board, officer, committee or other Town agency may expend Town funds in carrying them out provided that appropriations specifically designed for such purposes have been voted by the Town Meeting.



TOWN OF ARLINGTON

EQUAL OPPORTUNITY ADVISORY COMMITTEE

730 MASSACHUSETTS AVENUE, ARLINGTON, MA 02476
PHONE (781) 316-3120 FAX: (781) 316-3129

TRICIA O'DONOGHUE, CHAIR
BARBARA BOLTZ
AUGUSTA HAYDOCK
JACK JONES

CARYN COVE MALLOY
EQUAL OPPORTUNITY OFFICER

CONTRACTOR CERTIFICATION

During the performance of the Contract, the Contractor and all subcontractors (hereafter collectively referred to as "the Contractor") for a town construction contract or town assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

The Contractor shall comply with the provisions of Town of Arlington Bylaws, Anti-Discrimination policies and Chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this contract.

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barrier in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, gender identity, sexual orientation, age, genetic information, ancestry, children, marital status, veteran status or membership in the armed service, the receiving of public assistance, and handicap. Such affirmative action measures shall entail a list of positive and aggressive measures which shall include but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority women and other community-based organizations of employment opportunities; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying this Committee in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker.

The Contractor shall submit to the Equal Opportunity Advisory Committee, through the Purchasing Director Domenic Lanzillotti, the following Contractor's Certification with all attachments. The Contractor's Certification will be reviewed by the Committee and will inform the Contractor of any deficiencies to be corrected.

CONTRACTOR CERTIFICATION

_____ certifies that they:
(Contractor Name)

1. Will not discriminate in their employment practices.
2. Intend to use, if General Contractor, the following listed construction trades in the work under the contract:

3. If Trade Subcontractor, will provide the following work under the contract:

4. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals of the Town of Arlington and the Commonwealth of Massachusetts and specific affirmative steps contained herein; and to provide evidence of its good faith efforts. Attached hereto, please find:

- A. Employment Opportunities advertised in:

- B. Notification to Minority/Women/Community based Organizations such as:

C. List of workers referred to Contractor and note on what action was taken:

D. Written notification that Union/Local No. _____ failed to refer a Minority or
Female worker during the week of: _____

Signature of Officer

Date

Printed Name of Officer and Title

PART B - SPECIFICATIONS
DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The GENERAL CONDITIONS and all other Sections of Division I, General Requirements apply to this section.

1.02 PROJECT SCOPE

- A. Project Description: This project site is located at 25 Drake Road, Arlington MA at the existing Hurd Field.
1. Protection of existing roadways, walkways, parking areas, utilities, fencing, and associated facilities as indicated on the Drawings.
 2. Earthwork to provide a cut/fill to the grades shown on the plans and in the specifications within the limit of work.
 3. Installation of subsurface and at-grade storm drainage.
 4. Installation of new porous asphalt walkways.
 5. Installing pervious pavers at plaza.
 6. Installation of new irrigation system.
 7. Amending, resspreading, and fine grading of the existing topsoil.
 8. Sodding of the topsoil.
 9. Maintenance of the sodded surface until establishment.
 10. Installing planting.
 11. New utility and storage sheds, as well as a portable toilet enclosure
 12. Retrofitting existing and installing new sport lighting system
- B. In addition, the work under the Contract includes:
1. Work outside the Project Site as called for in the Contract Documents and as required for the performance of the Work.
 2. The restoration of any items damaged or destroyed by encroaching upon areas outside the Project Site.

3. Providing and restoring, where appropriate, all temporary facilities.

1.03 PERMITS AND FEES

- A. The Contractor, at its cost, shall schedule, secure and obtain all permits, approvals, licenses, and inspections necessary for the proper execution of the work under all sections of this project.
- B. The Contractor shall coordinate all his work with appropriate Town of Lincoln Departments and Agencies as required by the Contract Documents.

1.04 TIME OF COMPLETION

- A. In accordance with the General Conditions, the Work shall be commenced at the time stated in the Notice to Proceed and shall be completed as noted in Section 00 21 13 – Instructions to Bidders and Section 01 70 00 – Project Closeout.

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The unit prices for items set forth in the schedule of unit prices may be used to determine adjustments to the contract sum when changes in the work involving said items are made in accordance with General Conditions, Supplementary General Conditions and other Sections of the Contract Documents.

1.02 REQUIREMENTS

- A. Unit prices for changes to the work not part of the Base Bid will be paid in accordance with unit prices listed by the Contractor on the Schedule of unit prices, based on quantities measured in the field.
- B. All unit prices shall include their pro-rata share of all costs for overhead, profit, bond, materials, equipment and disposal required to complete the work item.
- C. The Owner may choose not to approve any or all unit prices prior to award of the contract if it deems the unit price unreasonable. In this case, the change order process described in the general conditions will be used for work described in the unit price schedule, when any change of the base contract scope is required.

1.03 APPLICABILITY OF UNIT PRICES

- A. The payment lines shall be as indicated in the Contract Documents.
- B. Prior to commencing any change to the work involving removal or placement of materials set forth in the schedule of unit prices, the Contractor shall notify the Owner's Representative in sufficient time to permit proper measurements to be taken on behalf of the Owner. Only quantities which have been approved in writing by the Owner's Representative and/or Owner will be considered in the determination of adjustments to the contract sum.
- C. Performance of work which is not required under the Contract Documents or which is not authorized by Change Order, whether or not such work item is set forth hereunder as a Unit price item, shall not be considered cause for extra payment. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Owner's Representative and/or Owner.

1.04 SCHEDULE OF UNIT PRICES

- A. The List of proposed unit prices for the above referenced project is included in the Bid Form for completion by the Contractor.

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The GENERAL CONDITIONS and all other Sections of Division I, General Requirements apply to this Section.

1.02 SCOPE

- A. This Section lists the Alternates which appear in the Contract Documents. Consult the individual Sections for requirements applicable to all alternatives.
- B. Bid prices for each Alternate shall include overhead, profit, and all other expenses incidental to the Work under each Alternate.
- C. The Contractor and Subcontractors shall be responsible for examining the scope of each Alternate generally defined herein and for recognizing modifications to the Work caused by the Alternates and including the cost thereof in the bid price.

1.03 ALTERNATE NO. 1

- 1. N/A

END OF SECTION

SECTION 01 31 12.10
CONDUCT OF THE WORK

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 PROJECT MANAGEMENT

- A. The Contractor's attention is directed to the General Conditions.
- B. The work must be completed in a continuous, uninterrupted operation until the close of the project. The Contractor must use sufficient personnel and adequate equipment to complete all the necessary work requirements within a minimum period of time.
- C. The Contractor is responsible for the security of partially completed work until the project is finally accepted by the Owner.
- D. The General Contractor shall ensure continued, safe, unencumbered access to all adjacent properties during the construction period. The General Contractor shall phase and otherwise schedule construction in such a manner as to provide required access to all portions of the property not under construction.
- E. Areas of active construction, as noted on the plans, shall be fenced in accordance with SECTION 02 00 00, SITE REQUIREMENTS, herein.
- F. Five days prior to the commencement of site demolition the General Contractor shall submit to the Owner's Representative, for review and approval, a plan which indicates the sequence and schedule of construction of this contract. Construction shall not proceed until this plan has been reviewed and accepted.

1.03 COORDINATION

- A. The Contractor shall submit for approval to the Owner a detailed operational plan showing the sequence of operations prior to commencement of any work at the site. Any changes to this operational plan must be approved by the Owner.
- B. The Contractor must retain at the site a competent full time representative for the duration of the work, satisfactory to the Owner. This representative shall not be changed, except with the consent of the Owner. The representative shall be in full charge of the work and all instructions given to this person by the Owner's Representative shall be binding.

- C. The Contractor must supply to the Owner the home telephone number of a responsible person who may be contacted out-of-hours for emergencies on the Project.

1.04 OWNER'S COOPERATION

- A. The Owner shall assist the Contractor to perform the Work in accordance with the approved operational plan by removing obstructions that may be in the Contractor's way, upon proper notice from the Contractor.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General Conditions, Supplementary Conditions, and other Division 1 - General Requirements, apply to the work of this Section.
- B. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 PROJECT MEETINGS

- A. Preconstruction Conferences: Conduct a preconstruction conference prior to beginning work on site. Require all major subcontractors and suppliers to attend. In general, the meeting shall cover the following subjects:
 - 1. Creation of project team directory listing contract person for each organization.
 - 2. Issuance of Contract Documents.
 - 3. Contractors Detailed Baseline Schedule
 - 4. Review of project constraints and work hours.
 - 5. Unloading policies, storage locations, temporary office locations, and temporary facilities.
 - 6. First aid, safety, and security procedures.
 - 7. Cleaning, housekeeping, and waste removal.
 - 8. Change order requirements.
 - 9. Progress payment requirements.
 - 10. Submittal requirements, schedules, and procedures.
 - 11. Record document requirements and procedures.
 - 12. Other subjects as determined by the Contractor, Owner, and Owner's Representative.
- B. Regular Progress Meetings: Conduct Progress Meetings to aid coordination and planning of the work and to create a forum to resolve coordination and scheduling problems and conflicts. Regular project meetings will be held on a

weekly basis at the job site. Special project meetings may be called at any time by the Owner or Owner's Representative, and shall be attended by the Contractor and any required Subcontractors.

1. Chairperson and Minutes: The Owner's Representative will chair the meetings and will prepare written meeting minutes.
2. The Contractor shall require representatives of all major subcontractors and suppliers to attend each Progress Meeting as required. Representatives of Contractor, Subcontractors, and suppliers who are present at Progress Meetings shall have the full authority to commit their respective organizations to decisions, commitments, and agreements made at Progress Meetings.
3. Progress Meeting Agenda: Progress Meetings shall have at least the following agenda:
 - a. Review and approval of minutes and record of previous meeting.
 - b. Review progress of work; Progress Schedule in comparison to the Projects Baseline Schedule, and if any deviation from the Baseline Schedule review corrective actions to realign with Baseline Schedule.
 - c. Review Status of Submittals. Progress Schedule shall follow Critical Path for the original baseline schedule submitted.
 - d. Identify problems that impede planned progress.
 - e. Develop corrective measures and procedures to maintain planned schedule.
 - f. Review apparent conflicts and other problems, and develop corrective measures.
 - g. Monthly review of payment applications.
 - h. Pre-installation discussions regarding specific project items.
 - i. Other current business.

END OF SECTION

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Consult the individual sections of the specifications for the specific submittals required under those sections and for further details and descriptions of the requirements.

1.02 GENERAL PROCEDURES FOR SUBMITTALS

- A. Timeliness - The Contractor shall transmit each submittal to the Owner's Representative at least 5 days in advance of performing related Work or other applicable activities, so that the installation will not be delayed by processing times, including disapproval and re-submittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Owner's Representative in advance of the Work.
- B. Sequence - The Contractor shall transmit each submittal in a sequence which will not result in the approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.
- C. Contractor's Review and Approval - Only submittals received from and bearing the stamp of approval of the Contractor will be considered for review by the Owner's Representative. Submittals shall be accompanied by a transmittal notice, stating name of Project, date of submittal, "To" or "From" (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section or Drawing No. to which the submittal refers, purpose (first submittal, re-submittal), description, remarks, distribution record, and signature of transmitter.
- D. Any reference as to a specific type or manufacturer in these specifications is for identification purposes only. Equivalent products will be considered. In the event that samples or specifications on equivalent products are required, it will be at the vendor's expense.
- E. Or-Equivalents - On the transmittal, or on a separate sheet attached to the transmittal, the Contractor shall direct attention to any deviations including minor limitations and variations, from the Contract Documents.
 - 1. The Contractor and all Subcontractors shall submit to the Owner's Representative for consideration of any Or-equivalent substitution, a written point by point comparison containing the name and full particulars of the proposed product to the product named or described in the Contract Documents.

2. Such submittal shall in no event be made later than 5 calendar days prior to the incorporation of the item into the Work. In any case in which the time period specified in the Contract Documents from the Notice to Proceed to Substantial Completion is less than 5 days, the Owner's Representative can waive this requirement.
 3. Upon receipt of a written request for approval of an Or-equivalent substitution, the Owner's Representative shall investigate whether the proposed item shall be considered equivalent to the item named or described in the Contract Documents. Upon conclusion of the investigation, the Owner's Representative shall promptly advise that the item is, or is not, considered acceptable as an Or-equivalent substitution. Such written notice must have the concurrence of the Owner.
 4. In no case may an item be furnished on the Work other than the item named or described, unless the Owner's Representative, with the Owner's concurrence, shall consider the item equivalent to the item so named or described.
 5. The equivalency of items offered as "equivalent to" items named or described shall be proved to the satisfaction of the Owner's Representative at the expense of the Contractor or Subcontractor submitting the substitution.
 6. The Owner's Representative and/or the Owner may require that full size samples of both the specified and proposed products be submitted for review and evaluation. The Contractor or Subcontractor, as the case may be, shall bear full cost for providing, delivering, and disposal of all such samples.
 7. The Contractor or Subcontractor, as the case may be, shall assume full responsibility for the performance of any item submitted as an "Or-equivalent" and assume the costs of any changes in any Work that may be due to such substitution.
- F. Processing - All costs for printing, preparing, packaging, submitting, resubmitting, and mailing, or delivering submittals required by this contract shall be included in the Contract Sum.

1.03 OWNER'S REPRESENTATIVE'S ACTION

- A. The Owner's Representative will review the Contractor's submittals and return them with one of the following actions recorded thereon by appropriate markings:
1. Final Unrestricted Release: Where marked "Reviewed" the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents.
 2. Final-But-Restricted Release: When marked "Reviewed as Modified" the

Work may proceed provided it complies with the Owner's Representative's notations or corrections on the submittal and complies with the requirements of the Contract Documents. Acceptance of the Work will depend upon these compliances.

3. Returned for Resubmittal: When marked "Revise & Resubmit" or "Not reviewed", the Work covered by the submittal (purchasing, fabrication, delivery, or other activity) should not proceed. The submittal should be revised or a new submittal resubmitted without delay, in accordance with the Owner's Representative's notations stating the reasons for returning the submittal.

1.04 SUBMISSION OF SHOP DRAWINGS & PRODUCT DATA

- A. Shop Drawings shall be complete, give all information necessary or requested in the individual section of the specifications. They shall also show adjoining Work and details of connection thereto.
- B. Shop Drawings shall be for whole systems. Partial submissions will not be accepted.
- C. The Owner's Representative reserves the right to review and approve shop drawings only after approval of related product data and samples.
- D. Shop drawings shall be properly identified and contain the name of the project, name of the firm submitting the shop drawings, shop drawing number, date of shop drawings and revisions, Contractor's stamp of approval, and sufficient spaces near the title block for the Owner's Representative's stamp.
- E. The Contractor shall submit to the Owner's Representative one legible, reproducible transparency and two black line prints of each shop drawing. Transparency and prints shall be mailed or delivered in roll form. A transmittal notice shall accompany each submittal.
- F. When the transparency is returned by the Owner's Representative with the stamp "Revise and Resubmit" or "Rejected", the Contractor shall correct the original drawing or prepare a new drawing and resubmit a transparency and two prints thereof to the Owner's Representative for approval. This procedure shall be repeated until the Owner's Representative's approval is obtained.
- G. When the transparency is returned by the Owner's Representative with the stamp "Reviewed, and no exception taken", the Contractor shall provide and distribute the prints for all Contractor and Subcontractors use, and in addition submit, within 10 calendar days after approval, 5 prints to the Owner's Representative.
- H. The Contractor shall maintain one full set of approved shop drawings at the site.
- I. Unless otherwise noted, submit four (4) sets of product submittals to the office of the Owner's Representative and one (1) set to the Owner.

1.05 SUBMISSION OF SAMPLES

- A. Unless otherwise specified in the individual section, the Contractor shall submit two specimens of each sample.
- B. Samples shall be of adequate size to permit proper evaluation of materials. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of approved samples will not be approved on the Work.
- C. Samples that can be conveniently mailed shall be sent directly to the Owner's Representative, accompanied by a transmittal notice. All transmittals shall be stamped with the Contractor's approval stamp of the material submitted.
- D. All other samples shall be delivered at the field office of the Project Representative with sample identification tag attached and properly filled in. Transmittal notice of samples so delivered with the Contractor's stamp of approval shall be mailed to the Owner's Representative.
- E. If a sample is rejected by the Owner's Representative, a new sample shall be resubmitted in a manner specified herein above. This procedure shall be repeated until the Owner's Representative approves the sample.
- F. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not particular mention is made in the specifications.

END OF SECTION

SECTION 01 45 00
QUALITY CONTROL

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 TESTING AND SPECIAL TESTING

- A. Refer to the General Conditions and Supplementary Conditions for general requirements, and technical specifications for specific testing requirements and methods.
- B. Unless otherwise provided in the specifications, the Contractor or assigned subcontractor shall provide all materials, samples, mock-ups or assemblies for all tests specified in various sections of specifications, or as directed by the Engineer, and pay shipping costs of such samples to laboratory or other testing location and facility. Unless specified otherwise, all tests shall be made by an approved independent testing laboratory and reports provided to Engineer.
- C. Tests shall be provided and accomplished in accordance with the standard used as the reference for the particular material or product, unless other test methods or criteria are specified. In the absence of a referenced standard, tests shall be accomplished in accordance with applicable ASTM Standards or Test Methods, current at the date of the Contract Document.
- D. The Owner will employ and pay for any special inspector to provide the inspections during construction as may be required by applicable codes, such as Massachusetts State Building Code. The Contractor shall coordinate his operations with the inspector and cooperate with the inspector in the required inspections.

1.03 QUALIFICATIONS OF TESTING AGENCY

- A. "Approved independent testing laboratory" shall mean an independent testing agency acceptable to the Owner and the Engineer and possessing the professional qualifications and equipment to perform the specified tests and to evaluate the report the results.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of ASTM E29 and ASTM D3740.
- B. Laboratory shall maintain a full-time registered Engineer on staff to review services.

- C. Laboratory authorized to operate in State in which Project is located.
- D. Testing equipment shall be calibrated at reasonable intervals with devices of accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.05 REFERENCES

- A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E29 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.06 PAYMENT FOR TESTS

- A. Tests to be paid for by the Owner will be paid directly to the testing laboratory by the Owner.
- B. The Owner will not pay for tests to determine if a proposed material will initially meet the specified requirements, which will include but not be limited to, concrete aggregate analysis, concrete design mixes, concrete block for initial approval, precast concrete implant tests, brick being considered for selection, analysis of paving aggregate, paving mix designs, and similar tests. The Owner will not pay for testing of irrigation, mechanical and electrical systems.
- C. The General Contractor will pay for the following testing:
 - 1. All soil material testing.
 - 2. All irrigation testing.
- D. The following is the list of the type of tests the Owner will pay for, where tests are specified or later determined as necessary:
 - 1. All soil compaction testing
 - 2. Concrete compressive strength
 - 3. Review mix designs
 - 4. Grout samples
 - 5. Steel reinforcement
 - 6. Materials and welding
 - 7. Concrete air entrainment
 - 8. PIF/pier/casson inspection
 - 9. Concrete plant inspection
 - 10. Engineered fill
 - 11. Site work flow test
 - 12. Review welding procedures
 - 13. Welding or brazing of piping
 - 14. Paving samples
 - 15. Unit masonry sampled from site

16. Mortar samples
 17. Fireproofing samples
 18. Waterproofing/roofing samples
 19. Acoustic testing
 20. Electrical systems, including light level and intensity
 21. Structural observation/inspection
 22. Special inspections
- E. The Contractor or assigned Subcontractor shall be responsible for, and shall pay for, all off-site and on-site tests except those listed in Paragraph 1.06.D.
- F. The Owner's Representative and the Engineer's Field Representative shall have the right to witness all off-site and on-site tests performed by the Contractor or assigned subcontractor and the Contractor shall furnish adequate notice of when tests will be made.
- G. When in the opinion of the Engineer's Field Representative, additional tests or inspections are required because of the manner in which the Contractor executes its work, such tests and inspections shall be paid for by the Owner, but will be deducted from the contract price. Examples of such tests and inspections are:
1. Tests of materials substituted for previously accepted materials, or substitute for specified materials; retests made necessary by failure of materials to comply with the requirements of the specifications; load tests made necessary because of portions of the structure not fully meeting specifications or plan requirements, etc.

1.07 TESTS TO DEMONSTRATE QUALIFICATION

- A. In addition to tests specified, should the Contractor propose a product, material, method of assembly that is of unknown or questionable quality to the Engineer, the Engineer may require and order suitable tests to establish a basis for acceptance or rejection. Such tests will be paid for by the Contractor, or by the Subcontractor requesting approval. "Standard" test reports on "similar" material will not be acceptable.
- B. The Owner and Engineer reserve the right to require certification or other proof that the material, assembly, equipment, system or other product furnished or proposed to be furnished, for this Project is in compliance with any test or standard called for. The certificate shall be signed by a representative of the independent testing laboratory.
- C. Any tests required to qualify the Contractor or any of his workmen for any phase of the work, and any test of a method, system or equipment that may be required by specification or law to qualify the item for use, shall be made or taken without additional reimbursement.
- D. If exploratory work is required to determine the cause of defects, the cost of such work shall be borne by the Contractor or assigned subcontractor responsible for

such work if the work is found, in the judgment of the Engineer to be defective. If the Contractor or assigned subcontractor responsible for the work is adjudged by the Engineer to be not at fault, exploratory testing will be paid by the Owner.

1.08 INSPECTIONS

- A. Should the specifications, Engineer's instructions, laws, ordinances or any public authority require any work to be inspected or approved, the Contractor shall give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.

1.09 CERTIFICATES

- A. Except for test reports provided and signed by approved independent testing laboratories, all certificates required by the specification shall be signed by an authorized official of the firm providing the certificate, with the signature notarized, when such certificates by the producer are acceptable to the Engineer.

1.10 RETEST RESPONSIBILITY

- A. Where results of required inspections, tests or similar prove unsatisfactory and do not indicate compliance of related work with requirements of the contract documents, then retests are responsibility of Contractor or assigned subcontractor, regardless of whether original test was Contractor's responsibility. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work.
- B. Owner's decision on unsatisfactory testing resulting or retesting of work based on consultation with Testing Laboratory and Owner's Representative is final.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The General Conditions of the Contract, Supplementary General Conditions and all other Sections of Division I, General Requirements apply to this section.
- B. The Contractor shall be responsible for providing and maintaining all temporary facilities until Substantial Completion. Removal of such, prior to Substantial Completion must be with the concurrence of the Owner's Representative. The Contractor bears full responsibility for re-providing any facility removed prior to Substantial Completion if required for the work.
- C. Removal of all temporary facilities shall be a condition precedent to Substantial Completion unless directed otherwise by the Owner's Representative or specifically noted in the Specifications.
- D. The Contractor must comply with all safety laws and regulations of the Commonwealth of Massachusetts, the United States Government, and local government agencies applicable to work under this contract. The Contractor's attention is directed to the Commonwealth of Massachusetts, Department of Labor and Industries Regulation 454 CMR.

1.02 TEMPORARY TELEPHONES

- A. Telephone service, in the form of a cellular phone and beeper, shall be available on site.
- B. The Contractor shall pay for all equipment charges for the foregoing temporary telephones and for all calls and charges in connection therewith.

1.03 TOILETS

- A. The Contractor shall provide portable bathroom facilities as required.

1.04 TEMPORARY STRUCTURES AND MATERIAL HANDLING

- A. Materials shall be handled, stored, installed, cleaned, and protected in accordance with the best practice in the industry and, except where otherwise specified in the Contract Documents, in accordance with manufacturer's specifications and directions.

1.05 TEMPORARY WATER

- A. The Contractor may make use of the available water supply at the site for construction purposes, provided the permission of the Owner is obtained beforehand and only as long as the water is not used wastefully.

- B. The Contractor shall provide all necessary connections, piping and hoses to utilize the available sources of water.
- C. The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for personnel on the job.
- D. In the event that water is unavailable, the Contractor shall be responsible for providing water from off site sources.

1.06 TEMPORARY ELECTRICITY

- A. The Contractor may make use of the electricity available at the site, metered and paid for by the Owner, provided that the Contractor shall supply proper adapters and extension cords. Where heavy duty electric equipment drawing current in excess of 15 amp. is involved, the Contractor shall provide temporary service to supply the power. The temporary electric service shall include, but not be limited to labor, materials, and equipment necessary to supply temporary power of adequate capacity for the project. Transformers and meters, when required by the power company, will be furnished by the power company and the Contractor shall be the costs therefore.
- B. Temporary electrical work shall be performed under the direct supervision of at least one master electrician, who will be present on the project at all times when such work is being performed.
- C. All temporary work shall be provided in conformity with the National Electric Code, State Laws and requirements of the power company. Particular attention is called to Commonwealth of Massachusetts, Department of Labor and Industries Regulation, 454CMR.
- D. The Contractor shall dismantle and completely remove from the project site, temporary electrical facilities only when the permanent electrical system is operational.

END OF SECTION

SECTION 01 70 00
PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The General Conditions of the Contract, Supplementary General Conditions and all other Sections of Division I, General Requirements apply to this section.

1.02 RELATED DOCUMENTS

- A. This section supplements the General Conditions, Supplementary General Conditions and Division 1.
- B. Consult the individual sections of the specifications for specific items required under those sections.

1.03 SUBSTANTIAL COMPLETION

- A. Prior to requesting Substantial Completion as provided in the General Conditions the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor and Subcontractor items to be provided under the Contract Documents.
- B. Upon completion of the list, the Contractor shall notify, in writing, the Owner's Representative that the Work is Substantially Complete. The Owner's Representative shall then conduct a similar thorough inspection. If the Owner's Representative agrees that the Work is Substantially Complete, the Owner's Representative will promptly make a thorough inspection and prepare a monetized punch list, setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable or incomplete. The Contractor shall coordinate all Subcontractors to achieve prompt completion of the punch list.
- C. The Contractor shall not be relieved of the responsibility to provide Contract items left off of the Owner's Representative's punch list.
- D. If the Owner's Representative determines that the Work is not Substantially Complete, the Owner's Representative shall inform the Contractor of those items that must be completed before the Owner's Representative will prepare a monetized punch list. Upon completion of those items, the Contractor shall again request the Owner's Representative to prepare a punch list.
- E. When the punch list has been prepared, the Owner's Representative will arrange a meeting with the Contractor and Subcontractors to identify and explain all punch list items and answer questions on work which must be done before final

acceptance.

- F. The Owner's Representative may revise the punch list, from time to time, to ensure that all items of Work are properly completed.
- G. The Owner's Representative shall prepare the Certificate of Substantial Completion in accordance with the General Conditions.

1.04 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Prior to final payment and completion the Contractor shall provide all Operating Manuals and Maintenance Instructions as required by the Contract Documents and as requested by the Owner.
- B. Consult the individual sections of the specifications for the specific requirements for those sections and for further details and descriptions of the requirements.
- C. Operating Instructions and Manuals:
 - 1. The Contractor shall collect all of the above instructions and copies of all approved submittals and bind them into three complete sets in three ring binders, and submit them to the Owner's Representative who will deliver them to the Owner.
 - 2. Submission of operating and maintenance instructions shall be a condition precedent to final payment.
- D. Instruction of Owner's Personnel:
 - 1. Where specified in the individual sections of the specifications, the Contractor and Subcontractor shall instruct the Owner's personnel at the site, in the use and maintenance of equipment installed under the Contract.
 - 2. Submission to the Owner's Representative of a certificate of compliance to this requirement, signed by the Contractor and the Owner, shall be a condition precedent to final payment.

1.05 FINAL COMPLETION

- A. Related Requirements:
 - 1. The Contractor's attention is directed to the General Conditions of the Contract.
- B. Final Completion:
 - 1. Within seven (7) days after Substantial Completion, if any of the items on the Owner's Representative's punch list are not complete or if the Contractor has not provided the appropriate Record Drawings, Operating

Manuals, Warranties, Guarantees, or Spare Parts, the Owner's Representative may assign a monetary value for each incomplete item as well as any other items as provided by M.G.L. c.30 sec.39K.

2. The Contractor shall provide the Owner's Representative with a Notarized Contractor's Certificate and Release and an appropriate Application for Payment. This Application shall be for an amount equal to the remaining balance of the Contract less the amount of the Owner's Representative's monetized punch list and any other items as provided under M.G.L. c.30 sec.39K.
3. The Contractor shall complete all remaining Work in accordance with the provisions of the General Conditions of the Contract.
4. Upon completion of all remaining items, and after receipt of all appropriate Shop Drawings, Record Drawings, Operating Manuals, Warranties, Guarantees and Spare Parts required by the Contract Documents, The Contractor shall provide a notarized Contractor's Certificate and Release and a final Application for Payment to complement this closeout process.

END OF SECTION

SECTION 01 78 29
RECORD DRAWINGS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The General Conditions of the Contract, Supplementary General Conditions and all other Sections of Division I, General Requirements apply to this section.

1.02 RECORD DRAWINGS

- A. Record Drawings shall consist of all the Contract Drawings.
- B. From the sets of drawings furnished by the Owner, the Contractor shall reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to all Subcontractors, the drawings of their portion of the Work for the same purpose.
- C. The Contractor and the above Subcontractors shall keep their record set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work, and any variations from the Contract Drawings. All changes, including those issued by Addendum, Change Order or instructions by the Owner's Representative shall be recorded. Record Drawings shall be prepared for the entire project and include all Work.
- D. The Owner's Representative may periodically inspect the Record Drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly requisitions for periodic payment.
- E. At Substantial Completion the Contractor shall submit the complete set of Record Drawings to the Owner's Representative. The Owner's Representative will review these drawings and return them to the Contractor with necessary comments.
- F. Upon receipt of an AUTOCAD compatible disk of the original contract drawings from the Owner's Representative, the Contractor and Subcontractors shall transfer the As-Built information shown on the Record Drawings. This electronic drafting shall be done by an experienced CAD operator and match the original Drawings.
- G. From the disks, the Contractor shall, at its own expense, prepare two sets of mylar transparencies and one set of blue-line prints and then submit the transparencies, blue-line prints, and the electronic files to the Owner's Representative. Each sheet shall be clearly marked "Record Drawing" and bear the date of printing. Submission of accurate Record Drawings and their approval by the Owner's Representative shall be a condition precedent to final payment.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General Conditions, Supplementary Conditions, and other Division 1 - General Requirements, apply to the work of this Section.
- B. This Section contains general information that applies to all work performed under the Contract and is inherently made a part of each specification section.

1.02 WARRANTY REQUIREMENTS

- A. Warranties Required: All materials, equipment, and work of the Project shall be covered by comprehensive written warranties. Refer to individual specification sections for additional specific warranty requirements. For work not specified to have additional specific warranty requirements or warranties longer than one year, provide a comprehensive one year written warranty signed by the Contractor and Subcontractor.
 - 1. Warranty Limitations: Warranties required under the Contract are in addition to and not in lieu of any remedy or warranty to which the Owner is entitled under law. Warranties required under the Contract shall not be interpreted as a waiver of any of the Owner's rights.
 - 2. Warranty Procurement: Do not purchase or subcontract for materials, equipment or work until it has been verified that parties required to provide and sign warranties are willing to do so and that warranty language, content, and form are approved by the Owner. Special warranty terms, conditions, and requirements are often specified. Ensure that warrantors subcontracting or purchasing the work.
 - 3. Warranties are Irrevocable: After a specific warranty's language, content, and form has been approved by the Owner and after the work covered by a specific warranty is subcontracted or purchase order given to a manufacturer, the warrantor shall not revoke or withhold the warranty for any reason including, without limitation, non-payment or incomplete payment by any party other than the Owner, except that if the work has not been installed in compliance with the warrantor's installation requirements, then the warranty may be temporarily withheld until corrections are made and the warrantor's installation requirements have been met.
 - 4. Warranty Forms: Submit written warranty forms to Owner through Owner's Representative for approval prior to award of subcontract, submission or purchase order, and execution of warranty. The manufacturer's standard warranty forms may not comply with the requirements of the Contract

Documents. Special warranty terms, conditions, and requirements are often specified and required.

- a. Standard Warranty Form: In the absence of specific written permission by the Owner, provide all warranties including the Contractor's comprehensive one year warranty on fully executed copies of the "Standard Warranty Form" included in this Section.
5. Executed Warranties: Furnish original or certified copies of each executed warranty to Owner for warranty and maintenance manuals. Comply with requirements of Section 01 78 36, Record Drawings.
6. Work Covered by Warranty: Contractor and warrantor shall remove and replace other work damaged as a result of failure of warranted materials, equipment, or work, and shall remove and replace other work which must be removed and replaced to provide access to and replacement of materials, equipment, or work covered under warranty. Warranties shall include full payment to the Owner for work related to warranty repair or replacement including, without limitation, painting.
7. Pro-Rated Warranties: Unless otherwise specified or approved in writing by Owner, each warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life or warranty period.
8. Warranty Extensions: Work repaired or replaced under warranty shall be provided with a new warranty equal to the full length of the original warranty. The new warranty shall begin on the date of Owner's acceptance and use of the replaced or repaired item.
9. Warranty Effective Starting Date: All warranties shall begin on Date of Final Acceptance of the entire project or Owner's acceptance of the work or item covered by the warranty, whichever is later, and the warranty coverage shall continue for the period specified. If no specific warranty period is specified, the warranty shall extend for one year (365 days).
10. Contractor's Responsibilities for Warranties: The Contractor shall implement and invoke all guarantees and warranties provided by subcontractors, manufacturers, material suppliers, and other parties, including warranties longer than one year duration. The Contractor shall make every effort to facilitate, expedite, and aid the Owner in warranty claims the Owner may have throughout the warranty periods.

END OF SECTION

PART B - SPECIFICATIONS
DIVISION 2 – SITE CONSTRUCTION

SECTION 02 00 00
SITE REQUIREMENTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section, whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all under the Contract.

1.02 EXAMINATION OF SITE

- A. Prior to bidding the Contractor shall thoroughly examine the site and the Contract Documents to ensure his knowledge of conditions and requirements affecting the work. No claim for extra compensation or extension of time will be allowed for Contractor's failure to comply with this requirement nor will any condition at the site, whether or not in agreement with conditions shown or called for on the Bid and Contract Documents, be allowed as a basis for such claims, except as otherwise specifically provided for.

1.03 DISCOVERY

- A. If during the demolition, excavation, disposal, or other work, articles of unusual value, or of historical or archeological significance are encountered, the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Owner's Representative. If the nature of the article is such that the work can not proceed without danger of damaging same, work in that area shall be immediately discontinued until the Owner's Representative and/or Owner has decided the proper procedure to be followed. Any time lost thereby shall be a condition for which the time of the contract may be extended. All costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

1.04 COORDINATION WITH EXISTING UTILITIES

- A. The Contractor shall give all advance notice to public utility companies as required by law, and shall provide proper disposition, subject to Owner's Representative's and/or Owner's approval of all existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that in any way interfere with the work, whether or not they are specifically shown on the Drawings. He shall immediately notify the Owner and appropriate authorities when coming across an unknown utility line, and await decision as to how to dispose of same. When

an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged he shall notify the Owner and the Utility company involved, and assure the protection, support, or moving of utilities to adjust them to the new work. The Contractor shall be responsible for all damage caused to existing, active utilities under the work of this Contract, whether or not such utilities are shown on the Drawings, including resultant damages or injuries to persons or properties.

- B. Written notice shall be given by the Contractor to all public service corporations owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one (1) week in advance of the commencement of such operations, and the Contractor shall at that time file a copy of such notice with the Owner's representative.
- C. Before the Contractor begins any work or operations which might damage any subsurface structures, he shall carefully locate all such structures and conduct his operations so as to avoid any damage to them.
- D. Agents of various public service agencies, municipal and State departments may be entering on the work site to remove existing facilities, to construct or place new facilities or to make alterations to existing facilities.
- E. Prior to starting work or erecting permanent construction signing, the Contractor shall notify the "DIG-SAFE" program with a minimum of 72 hours advance warning. (The "DIG-SAFE" telephone number is 1-800-344-7233). Once located and marked, the Contractor shall maintain such marks and access to installations to permit repairs and maintenance of service if interrupted.
- F. The Contractor shall perform the work in cooperation with the various agencies in a manner that causes the least interference with the operations of the aforementioned agencies and shall have no claim for due to said work of these agencies.
- G. Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Owner's Representative and Owner.

1.05 WARNING

- A. Install warning fencing around all excavations and in all areas designated on the Drawings, as directed, and as required by law. Maintain fencing in place throughout length of construction period as directed by the Owner's Representative. After completion of construction, take down fencing and remove from the site.

1.06 FIELD LAYOUT

- A. Contractor shall maintain a level and transit on the job, and shall employ personnel for use thereof trained and registered as a Civil Engineer or as a registered Surveyor by the State of Massachusetts. The Owner and the Owner's Representative shall have reasonable use of these instruments at all times.
- B. Existing survey information on Drawings is for Contractor's use. Contractor shall establish benchmarks in at least two widely separated locations, and shall establish and maintain grades, lines, levels and other dimensional reference guides as required. The Contractor shall annotate project record documents to indicate all modifications of grades, utilities, etc.

1.07 PROTECTION OF PROPERTY AND THE PUBLIC

- A. Construct all fences, barricades, and protective facilities required for the protection of the public, in accordance with local and State regulations. Furnish and install all signs, lights, reflectors, and all such protection facilities as may be required.
- B. Contractor shall hold the Owner harmless from all claims arising from the use of public streets, sidewalks, and adjoining premises for construction purposes.
- C. Keep all access roads and walks clear of debris, materials, construction plans, and equipment, during work operations. Repair streets, drives, curbs, sidewalks, fences, poles and the like, where disturbed by construction. Leave them in as good conditions after completion of the work as before operations started. The Contractor shall contact appropriate Town officials concerning hauling of construction materials over Town roads and bridges.
- D. Provide ways and means to control the flow of water from every source which may cause delay or damage during the work operations.
- E. Protect all planting, landscaping, trees, and site improvements as indicated on the Drawings.
- F. The Contractor shall be responsible for the maintenance of construction barriers and traffic barriers in order to maintain traffic, over, through, or around the work included in his Contract with the maximum of safety and practicable convenience to such traffic during the life of the Contract, and whether or not work has been suspended temporarily. He shall take all precautions for preventing injuries to persons or damage to property to or about the work.
- G. The work shall be carried on and barriers erected in such a manner as to provide safe passage at all times for public travel and with least obstruction to traffic. The Contractor shall provide and maintain, at his own expense, in a safe and passable condition, such temporary by-passes as created by the barriers as may be necessary to accommodate both pedestrian and vehicular traffic.
- H. The Contractor shall maintain all legally required means of egress.

- I. Where the new construction or repair work coincides with the presently traveled way, the Contractor shall carry on his work so that travel will not be obstructed.
- J. Whenever gale or high winds are forecast, take proper measures to secure all loose material, equipment or other items which could blow about and be damaged or cause damage to other work. No such loose items shall be left unsecured at the end of the working day.
- K. All signs shall conform to local By-Laws and the Manual of Uniform Traffic Control Devices.

1.08 POLICE

- A. Whenever, in the opinion of the Owner or the Owner's Representative, traffic is sufficiently congested or public safety is endangered the Contractor will furnish police officers to direct traffic or to keep traffic off the area affected by construction operations. Such officers shall be in addition to flagmen required under other provisions of the Contract, and the cost shall be borne by the Contractor.
- B. The employment of traffic flagmen or the presence of police officers shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the Contract.

1.09 FIRE ACCESS

- A. The Contractor shall maintain fire lanes as required by the local Fire Department throughout the course of construction.

1.10 SPECIAL SECURITY AND CONTRACTOR'S RESPONSIBILITY FOR THE WORK

- A. The owner shall not provide security within the storage, staging, or construction areas nor will the Owner assume responsibility for acts of vandalism within these areas.
- B. Until written acceptance of the physical work by the Owner's Representative and/or Owner, the Contractor shall assume full charge thereof and he shall take every necessary precaution against damage to the work by action of the elements, or from any cause whatever, whether arising from the actions of the Contractor or not.
- C. The Contractor shall bear all losses resulting to him on account of vandalism.
- D. The Contractor shall rebuild, repair, restore, and make good all damages to any portion of the work occasioned by any of the above causes before the completion and written acceptance of the physical work, and shall bear the expense thereof.
- E. Should the Contractor fail to take prompt action whenever conditions make it necessary, the Owner shall make emergency repairs or cause the same to be

made, with the stipulation that the costs for such repairs shall be charged against the Contractor and deducted from monies due to him.

- F. In case of suspension of work from any cause whatever, the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and shall erect any necessary temporary structures, signs, or other facilities at his expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings and seeding furnished under this Contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

1.11 TEMPORARY BRACING, SHORING, SHEETING, TIE DOWN

- A. Provide all sheeting, shoring, bracing, underpinning, reinforcement and other temporary supports as may be required to maintain the integrity of, and prevent damage to, any structure or finish to be subjected to or adjacent to cutting work. Patch to restore to sufficient final strength, and acceptable appearance, subject to Owner's Representatives and/or Owner's approval.

1.12 SITE DRAINAGE

- A. Contractor shall take over responsibilities for existing site drainage upon entering premises, and maintain such drainage during the life of his Contract in a manner approved by the Owner's Representative and/or Owner and so as not to adversely affect adjacent areas.
- B. Keep excavations, pits, trenches and other construction areas free of water at all times, including backing up of drains and sewers. Provide hydraulic equipment to control surface and ground water. Pumping equipment shall be adequate to remove all hydrostatic pressure from structures until sufficient strength has been developed by the structure to protect work from displacement or other damage.
- C. Maintain ground water level where required sufficiently below excavation level at all times to maintain stable working platform. Ground water shall be controlled so as to avoid adverse effects on established ground water elevation of adjacent sites.

1.13 SITE TRENCHING AND EXCAVATION

- A. The Contractor shall obtain the Jackie's Law Trench Permit through the Town Engineering Department. Fees will be waived by the Town for this permit.
- B. Site Trenching and Excavation shall meet all applicable Local and State requirements.
- C. Open excavation adjacent to the traveled way or shoulders shall not remain through the hours of darkness, holiday or periods of shutdown, unless adequately

protected and specifically authorized by the Department of Public Works, Engineer, and Owner.

- D. If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure.
- E. Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this section, shall be considered included in the Contract price, and no additional compensation will be allowed therefore.
- F. Before starting any work for this Contract, the Contractor shall prepare and submit to the Owner's Representative for approval, a plan which indicates the traffic routing proposed by the Contractor during the various stages and time periods of the work and the temporary barricades, signs, cones, drums and other safety and traffic control devices to be employed during each stage and time period of the work to maintain traffic and access to abutting properties.
- G. Particular care should be taken to establish and maintain methods and procedures which will not create unnecessary or unusual hazards to public safety. Traffic control and safety devices required only during working hour operations shall be removed at the end of each working day.
- H. Signs having messages that are irrelevant to normal traffic conditions shall be removed or properly covered at the end of each work period. Signs shall be kept clean at all times and legends shall be distinctive and unmarred.
- I. All trenches with the right-of-way in pavements to remain shall be hot patched at the end of each work day as directed.
- J. All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the contractor and shall be removed from the site and legally disposed of. No separate payment will be made for this work, but all costs in connection therewith shall be included in the bid price of this Contract.

1.14 WINTER CONDITIONS

- A. Remove snow and ice which may impair progress of work, be detrimental to workmen, or impair trucking, delivery or moving of materials at job site, or prevent adequate drainage at site or adjoining areas.

1.15 COORDINATION

- A. The General Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, subcontractors, or material and equipment engaged upon the work. He shall be prepared to guarantee each of his subcontractors the dimensions which they may require for the fitting of their work to all surrounding work and shall perform or cause the subcontractors to

perform all cutting, fitting or adjusting and patching necessary to make all parts of the work come together properly and be fit to receive or be received by that of other Contractors.

- B. Before commencing any work, or any phase of the work, the Contractor shall prepare a sequence of operations for all work under this Division, and shall submit it for approval by the Owner's Representative and Owner at a Pre-Construction Conference.
- C. Before commencing any work, the Contractor shall consult with the Owner regarding any use of any facility, including, but not limited to, loading docks, parking areas, storage areas, etc., that may be required to prosecute the work.
- D. If, in the judgment of the Owner's Representative, continued work under the approved sequence of operations may interfere with the operations of any other construction projects at any time during the progress of the work, the Owner's Representative may direct the Contractor to accelerate, interrupt, or cease work at particular points. The Contractor shall make reasonable changes in the sequence of operations to accommodate these directions, at no additional cost to the Owner.
- E. The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, Subcontractors, or material and equipment engaged upon the work. He shall be prepared to guarantee each of his Subcontractors the dimensions which they may require for the fitting of their work to all surrounding work and shall perform or cause the subcontractors to perform all cutting, fitting or adjusting and patching necessary to make the several parts of the work come together properly and to fit the work to receive or be received by that of other Contractors.
- F. The General Contractor shall give his personal supervision to the work or have a competent superintendent with the authority to act for him on the job at all times during the progress of the work. The Contractor shall also provide an adequate staff for the proper coordination and expedition of his work.
- G. The General Contractor shall lay out his own work and shall be responsible for all lines, elevations, and measurements of the grading, landscaping and other work executed by him under the Contract. He shall exercise proper precaution to verify the dimensions shown on the Drawings before laying out the work, and will be held responsible for any error resulting from his failure to exercise such precaution.
- H. The Contractor's responsibility for the coordination of all work under the Contract shall be complete, and shall extend to all modifications in the work, whether or not such modifications entail a change in the Contract price. Where the Contract Documents allow an optional material or method, the Contractor shall provide all other coordination and additional work that such change necessitates, without any additional cost to the Owner.

1.16 MEASUREMENTS

- A. Before ordering any material or doing any work, the Contractor shall verify all measurements and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on the Drawings; any difference which may be found shall be submitted to the Owner's Representative and/or Owner, in writing, for consideration before proceeding with the work.

1.17 CONDUCT OF WORK

- A. The Contractor shall coordinate with the Owner and Owner's Representative, work in connection with adjacent occupied buildings or areas, driveways, walks or other facilities which would prevent access thereto or interrupt, restrict or otherwise infringe upon the Owner's use thereof.
- B. Damage to existing work, if caused by Contractor's operations under this Contract, shall be repaired at Contractor's expense.
- C. The Contract Site shall be shown on Drawings, and shall include the entire area bounded by the "Contractor's Work Area" or "Limit of Work" lines when required for performance of work under this Contract.
- D. Any street or other paving, curbs and/or sidewalks damaged as the result of work under this Contract, whether within or outside of the limits of the work, shall be repaired and/or replaced with new matching construction by the Contractor causing such damage, at his expense, and in a manner satisfactory to the Owner's Representative and authorities having jurisdiction thereover.
- E. Where existing curbs or walks are to remain, or after new curbs or walks are constructed and trucking is required over them, they shall be suitably protected in an approved manner.
- F. The Contractor shall provide continuous, lawful, safe, adequate and convenient access to the site. Access to the site shall generally be via existing roadways and paved surfaces which the Contractor shall maintain and restore to original condition. Contractor shall construct and maintain in good usable condition temporary roads or appurtenances as required, and when no longer required, remove temporary construction and restore such areas to their original condition.

1.18 CLEANING UP

- A. The following specific cleaning work shall be done:
 - 1. Concrete and masonry shall be cleaned free of all foreign matter. If, in the opinion of the Owner's Representative, further cleaning of specific areas is required they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as may otherwise specifically be permitted in the trade sections.

2. Surfaces with integral finishes shall be washed with clean water, mild soap and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags. Abrasive cleansers shall not be used.
3. Painted surfaces shall be cleaned free of all foreign matter, and if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags thoroughly rinsed, and wiped with clean, soft white rags.
4. Metal surfaces, hardware, equipment, and similar items shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean soft, white rags. Abrasive cleaners shall not be used.
5. All advertising matter and temporary instructional material shall be removed from exposed surfaces throughout.

1.19 PROJECT CLOSEOUT

- A. Punch List: When the Owner's Representative and/or Owner inspects the work for Substantial Completion, he will prepare and issue to the Contractor a "Punch List" of items to be corrected before final acceptance of work and payment can be made.

END OF SECTION

SECTION 13 34 16
BLEACHERS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Furnish and assemble semi-portable aluminum bleachers.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Cement Concrete Paving

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. ASTM A 36 - Structural Steel
 - 2. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - 3. ASTM B 308 - Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded
 - 4. ASTM E 34 - Chemical Analysis of Aluminum and Aluminum-Base Alloys
- B. American Welding Society (AWS).
 - 1. AWS D1.2 - Structural Welding Code - Aluminum.
- C. Commonwealth of Massachusetts (MA):
 - 1. Building Code - Massachusetts State Building Code (780 CMR).
 - 2. Architectural Access Regulations - The Architectural Access Regulations (521

CMR).

D. Americans with Disabilities Act (ADA):

1. ADA Ref. 1 - Americans with Disabilities Act of 1990

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's published product data including product specifications, installation instructions, test data and other pertinent technical data for each bleacher assembly.

B. Samples: Submit material and finish samples as follows:

1. 12 in. long section of seat board with specified finish.
2. 12 in. square piece of standard footboard with specified finish.
3. 12 in. square section of riser with specified finish.
4. Submit samples showing the complete range of colors, textures and finishes available for all components required for construction of custom team benches.

C. Manufacturer's Qualifications.

1. Satisfactory evidence of the proposed bleacher manufacturer's and installers experience and qualifications shall be submitted to the Landscape Architect for approval.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Provide services of installers trained and experienced in the necessary crafts and completely familiar with specified requirements and methods needed for proper installation of work.

A. All bleachers as manufactured and installed, including all handrails, railings, steps, and accessories shall conform to the requirements of the Commonwealth of Massachusetts State Building Code.

1. Each bleacher shall provide access, aisle widths, and seating areas for handicap to comply with required handicap codes, including ADA Ref. 1 and MA Architectural Access Regulations.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original unopened protective packaging

B. Store products in original packaging, under cover, in a manner preventing physical damage, soiling or wetting.

C. Protect product finishes against damage and stains during installation.

1.08 GUARANTEE

BLEACHERS

13 34 16 - 2

- A. Provide manufacturer's standard warranty for one year from date of Final Acceptance of installation, to repair or replace parts that become defective during warranty period, excluding parts subject to accident, abuse, misuse or neglect.

PART 2 - PRODUCTS

2.01 SEMI-PORTABLE ALUMINUM BLEACHERS

- A. Provide a 21' long, 33 seat semi-portable non-elevated pre-engineered 3 row aluminum bleacher to dimensions as shown on the drawings, similar to model Alum-A-Stand as manufactured by Dant-Clayton Corporation, P.O. Box 740008, 1500 Bernheim Lane, Louisville, KY 40201-7408, (502) 634-3626, or approved equivalent.
 - 1. Semi-portable Bleachers shall seat 33 and shall be of all aluminum tube and channel understructure and aluminum plank seats with slip-resistant surface.
 - 2. Provide powder coated colored risers and seat boards in manufacturer's standard colors with slip and stain resistant aluminum deck surfaces. Color to be selected by the Landscape Architect.
 - 3. Provide double footboards
 - 4. Provide stair aisle and aisle handrail.
 - 5. Provide a portability unit for moving the bleachers.
 - 6. Provide one (1).
 - 7. Bleacher shall be secured down to concrete pad using anchor bolts as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Bleachers shall be installed in accordance with the approved Submittals, including manufacturer's published specifications.

3.02 CLEAN-UP

- A. Remove trash and debris resulting from the work of this Section from premises and leave areas in an acceptable satisfactory condition. Touch-up shop finishes as necessary.

END OF SECTION

BLEACHERS

13 34 16 - 3

SECTION 26 05 01

BASIC ELECTRICAL REQUIREMENTS

PART 1: GENERAL

1.01 SYSTEM DESCRIPTIONS

- A. The following descriptions are to provide additional information regarding the scope of work, materials, and methods to be used in conjunction with other sections of this specification and the construction documents or drawings.
1. Panelboards: Install new panelboards and feeders as indicated. Install insulated grounding conductors with all panelboard and branch circuit feeders, size per the NEC Article 250. All panels shall be fully rated, series rated panels shall not be acceptable. All panelboards shall be bolt-on.
 2. Lighting: Install new sport lighting fixtures. Install conduits, handholes and wiring for sport lights.
 3. Lighting: Install new flood lighting fixtures. Install conduits, support brackets and wiring for flood lights.
 4. Lighting: Install new flag lighting fixtures. Install conduits and wiring for flag lights.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

1.03 DEFINITIONS

- A. As used in this Section, "provide" shall mean "furnish and install". "Furnish" shall mean "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "install" shall mean "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.04 CODES, PERMITS AND INSPECTION

- A. Manufacture, test, and install all work in accordance with applicable publications and standards of the following organizations:
1. American Society for Testing and Materials (ASTM)
 2. Underwriters' Laboratories, Inc. (UL)

3. Insulated Power Cable Engineers Association (IPCEA)
 4. National Electrical Manufacturers Association (NEMA)
 5. Institute of Electrical and Elec Engineers (IEEE)
 6. American National Standards Institute (ANSI)
 7. National Fire Protection Association (NFPA)
 8. Environmental Protection Agency (EPA)
 9. Local and State Electrical Codes
 10. National Board of Fire Underwriters
 11. Occupational Safety and Health Organization
 12. Building Officials and Code Administrators (BOCA)
- B. Comply with all laws applying, installations in effect in this City, Town or State; with regulations of any other governmental body or agency having jurisdiction; with regulations of the National Electrical Code where such regulations do not conflict with those laws; and with the regulations of the Electrical Utility Company supplying electrical energy to the premises.

1.05 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Shop Drawings:
1. The Contractor shall submit complete catalog information and Shop Drawings for all materials and equipment in accordance with the General Requirements. These shall include:
 - a. Catalog Data: Manufacturer's literature and illustrations.
 - b. Manufacturer's Specifications and Engineering Data.
- C. Shop Drawings: These shall contain sufficient plans, elevations, sections, details and schematics to describe work clearly. Shop Drawings shall be 1/8" = 1'-0" scale unless specified otherwise.
- D. Equipment Supplier's Certification (when required).
- E. Record Drawings of final approved system before final payment is made for this work.

1. All Shop Drawings shall be checked by the Contractor for accuracy and Contract requirements before the submittal to the Engineer. Shop Drawings shall bear the signature of the Contractor and date checked and shall be accompanied by a statement that the Drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop Drawings not so checked and noted by the Contractor shall be returned to him without approval.
 2. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Contract Drawings. The Engineer's approval shall in no way relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship required by the Contract Drawings and Specifications which may, or may not be indicated on the Shop Drawings.
 3. Catalog data shall include full information as to names, dimensions, materials, performance data, electrical characteristics and all other information pertinent to the adequacy of the equipment submitted.
 4. Shop Drawings shall be submitted for the following specific items:
 - a. Lighting Fixtures
 - b. Circuit Breakers
 - c. Contactors, and Disconnect Switches
 - d. Lighting Equipment
 - e. Wiring Devices
 - f. Lighting Control system
 - g. Enclosures
- C. Final Submittals:
1. As-built drawings:
 - a. During progress of the work, maintain an accurate record of the installation of the electrical system, locating each circuit precisely by dimension.
 - b. Upon completion of the electrical installation, transfer all record data to redlines prints of the original Drawings.
 2. Manual:
 - a. Upon completion of the electrical installation, and as a condition of its acceptance, deliver to the Owner and the Engineer one copy each of a Manual complied in accordance with the provisions of Section 1 of these Specifications; include one copy of as-built Drawings in each copy of the Manual.

1.06 COORDINATION, INTENT AND DISCREPANCIES

A. Intent:

1. The Contract Drawings and the sections of the Specifications are complimentary each to the other.
2. Materials and work which are indicated in one shall be as binding as if indicated in both.
3. Verify all dimensions by field measurements.
4. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
5. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
6. The Drawings are intended to indicate only diagrammatically the extent, general character, and approximate locations of the work included.
7. Exact locations must be coordinated with local conditions and with other trades.
8. Work indicated, but having minor details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner.
9. Follow Drawings and this Section of the work fitted thereto.
10. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible, Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form where coordination requirements conflict with individual system requirements.
11. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
12. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
13. Electrical equipment shall not be mounted in areas where it will be subject to physical damage or be a hazard to human life. All electrical equipment shall be suitably rated for the area installed taking into consideration the intended use for the area.

14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
 15. All equipment shown on the Drawings is intended to be generally representative of the equipment which will be installed under this Contract, but it shall not be assumed that the Drawings indicate the specific configuration, arrangement or points of connection of the actual equipment which will be purchased.
 16. The entire work provided for in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner, according to the accompanying Drawings and this specification.
 17. The bidder shall include in his bid, all cost required to adopt the actual equipment he intends to purchase to the general layout indicated on the Drawings and to provide a complete and operable system.
 18. Typical details shown on the Drawings shall apply to each and every item of the project where such items are incorporated; details are not repeated in full on all Drawings, but the intention that such details shall be applicable in full.
- B. Departure from the Contract Drawings:
1. Submit details of such departures and the reasons therefore as soon as practical and within 30 days after award of the Contract, to the Architect for approval.
 2. No departures shall be made without signed approval of the Architect or his authorized agent.
- C. Coordination:
1. The Contractor shall keep fully informed as to the size, shape, and location of all openings required for his pipes and apparatus and shall give full information to the other trades so that the openings may be built in advance.
 2. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give attention to large equipment requiring positioning prior to closing in the building.
 3. The Contractor shall confer with all other trades relative to the location of apparatus and equipment and select locations so as not to conflict with work of other trades.
 4. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

5. Any conflict with other trades shall be referred immediately to the Architect for resolution.
6. If the interferences occurs, the Architect will determine which work is to be relocated, regardless of which was first installed.

D. Discrepancies:

1. If the Contractor, in the course of the work, finds any discrepancies between Drawings or equipment listed and the physical conditions of the site, or any errors or omissions in dimensions or instructions given by Drawings or equipment lists, he shall immediately notify the Architect, in writing, and the Architect shall promptly adjust the same.
2. Any work performed after such discovery, unless authorized by the Architect in writing, shall be at the Contractor's risk.
3. The Drawings are, in general, made to scale, but all measurements shall be taken from figured dimensions, and not by scaling.
4. Whether or not an error is believed to exist, deviations from the Drawings and dimensions given thereon shall be made only after written approval is received from the Architect.
5. The Contractor shall be responsible for comparing all Drawings and verifying all dimensions before laying out the work.
6. When measurements are affected by existing conditions, the Contractor shall take necessary field measurements and refer any differences in dimensions to the Architect.
7. Any and all errors in the work that might have been avoided by such field measurements shall be the responsibility of the Contractor.
8. When submitting proposal, give written notice to the Architect of any materials or apparatus in violation of laws, ordinances, rules or regulations of all authorities having jurisdiction, and notice of necessary items of work omitted.
9. If the Contractor fails to give such written notice, it shall be assumed that he has included cost of all items in his proposal, and he shall be held responsible for satisfactory functioning and approval of the entire installation without extra compensation.

1.07 ELECTRICAL IDENTIFICATION

A. Nameplates:

1. Provide engraved white laminated phenolic nameplates with black core for all panelboard, main service switchboard, motor starters, disconnects, control stations, etc.
 2. Secure nameplates to units by screws.
 3. Adhesive units are not acceptable.
 4. Nameplates for equipment other than distribution equipment shall state which unit it is for (e.g. water pump).
- B. Color-Coded Conduit Markers:
1. General: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits; designed for attachment to conduit by adhesive, adhesive lap joint of marker, matching adhesive plastic tape at each end of marker, or pretensioned snap-on. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Provide 8" minimum length for 2" and smaller conduit, 12" length for larger conduit.
 - a. Colors: Unless otherwise indicated or required by governing regulations, provide white markers with black letters.
- C. Color-Coded Plastic Tape:
1. General: Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2" wide.
 - a. Colors: Unless otherwise indicated or required by governing regulations, provide orange tape.
- D. Underground-Type Plastic Line Marker:
1. General: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable.
- E. Cable/Conductor Identification Bands:
1. General: Provide manufacturer's standard aluminum wrap-around cable/conductor markers, of size required for proper application, and numbered to show circuit identification.
- F. Plasticized Tags:
1. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with

matt finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.

G. Lettering and Graphics:

1. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer, or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers,

1.08 EQUIPMENT FINISHES

- A. All finishes shall be in good condition at the completion of the job.
- B. Restore paint on all cabinets and enclosures by complete repainting, if necessary, because of damage to exterior finishes.

1.09 EQUIPMENT MOUNTING HEIGHTS

- A. Unless otherwise noted, mount devices and equipment at heights measured from finished floor/grade to device/equipment centerline as follows:
ceiling which-ever is lower
 1. Terminal cabinets, control cabinets, annunciator panels, to top
72"
of backbox
 2. Disconnect switches, motor starters, enclosed circuit breakers
48"
- B. Where structural or other interferences prevent compliance with mounting heights listed above, consult Architect to change locations before installation.

1.10 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
- B. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 1. Uncover Work to provide for installation of ill-timed Work.

2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Install equipment and materials in existing structures,
- C. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to, removal of electrical items indicated to be removed and items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Protection of installed Work: During cutting and patching operations, protect adjacent installations.
- G. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- H. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1.11 SERVICES OF MANUFACTURER'S REPRESENTATIVES

- A. The Contractor shall arrange for the equipment manufacturer to furnish the services of a qualified representative as necessary to check and supervise installations, to supervise its initial operation, and instruct operators in operation and proper maintenance.

1.12 TESTING

- A. General:
1. Demonstrate by conducting a test that the electrical system functions and performs as required to meet the needs of the Owner, and in accordance with the Drawings and specifications.
 2. Furnish personnel and calibrated instruments required for the tests and the Owner shall furnish power.

3. Conduct tests at a time acceptable to the Contractor and Owner.
4. Take ammeter and voltmeter readings of all motors when the motors are operating under maximum design system loads.
5. Clean and dry motors, contacts, relays, bus, insulators and other electrical apparatus if required.
6. Prior to applying voltage to any apparatus or circuit, make insulation resistance tests and, if necessary, dry the apparatus until resistance values conform to the standards of IEEE.
7. In drying out, use methods such that the insulation temperature of the apparatus does not exceed 90°C.
8. In case of a low resistance circuit insulation, eliminate the problem before the circuit is energized.
9. Make a recheck after apparatus is dry.
10. Record all insulation values and furnish to the owner for review.
11. Prior to the start of check-out and testing, insure that all equipment is properly and permanently identified.
12. Before energizing any electrical equipment or apparatus, check and verify that no tools, filings, foreign matter or other materials are left inside equipment or enclosures, particularly, bus conductors, conductor, terminal blocks and windings.
13. Check screw and bolt connections and terminal connections for tightness prior to final tests and energization.
14. Check the bearings of all rotating electrical apparatus and, if required, fill with the grease or oil as recommended by the manufacturers.
15. Provide 500 and 1000 V "megger" insulation testing during the construction and check-out period.
16. Megger motors and feeder cable from the starters prior to energizing and at the time of final checkout.
17. Check all motors for rotation and, if necessary, reverse the connections at the starter (for 3 phase) and/or at the motor (1 phase).
18. Test all main loops and major equipment grounds to remote earth or directly referenced to an extremely low resistance (approximately 20 ohms) reference ground benchmark.
19. Record, witness, and report ground test results to the Architect.

20. Make tests with ground testing ohm meter or timeegger.
21. Measure ground resistance of the individual networks at 2 points with cables at all the test points disconnected.
22. Reconnect the cables at the test points and make a duplicate set of ground resistance measurements.
23. Resistance shall not exceed 20 ohms.
24. Drive additional ground rods, if necessary.
25. Check all control circuits to see that their operation and sequence are correct.
26. Adjust any adjustable switches such as float switches, limit switches and timers for proper operation.
27. Prior to acceptance of the lighting facilities, clean all lighting fixtures and relamp where required at no additional cost to the Owner.
28. Replace all electrical equipment, wiring, switches and insulators found to be defective or to have failed due to poor workmanship promptly at no additional cost to the Owner.

1.13 GUARANTEE

- A. The Contractor shall and does hereby warrant and the General Contractor shall and does hereby guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of 1 year from the date of acceptance.
- B. The Contractor shall further warrant that all materials furnished and work executed are in accordance with all applicable laws and regulations.
- C. Contractor's guarantee for items furnished under Division 16 covers and includes:
 1. Faulty or inadequate design.
 2. Improper assembly or erection.
 3. Defective workmanship and materials.
 3. Leakage, breakage, or other failure.

1.14 CONTRACTOR'S DETAILED PHASING PLAN

- A. In conjunction with the construction schedule as stipulated in the documents, the

contractor shall prepare and submit a logical demolition and construction phasing plan for review and comment. The preliminary phasing plan shall be submitted for review and comment prior to the start of new work.

- B. The contractor's phasing plan shall be based on the contract documents and contractor confirmation of existing conditions and coordination of occupancy of adjacent areas of the building.
- C. The phasing plan shall include a logical sequence for demolition/removal and new construction which minimizes interruption of services, utilities and operations to occupied portions of the building. Include detailed sequence for shutoff of utility services to the occupied portions of the building to accommodate demolition and removal work, tie-ins of new conduit and wiring to existing systems, and temporary removal of electrical systems.
- D. All costs associated with the phasing activities including the design and installation of temporary lighting and or wiring are to be base bid of this contract.

PART 2: PRODUCTS

NOT USED

PART 3: EXECUTION

NOT USED

END OF SECTION

SECTION 26 05 02

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1: GENERAL

1.01 DESCRIPTION

- A. This Section, Basic Methods and Requirements (Electrical) applies to all sections of Division 26 and Division 1.
- B. Furnish and install electrical wiring, systems, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings items and arrangements for the specified items are shown on drawings
- C. Wiring ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are prohibited. Conductor sizes shall be based on circuit breaker sizes and sized per the NEC 2020 section 310. Adjust wire sizes accordingly to allow for voltage drop of no more than 3%.
- D. Requirements of the following Division 26 apply to this section
 - 1. Basic Electrical Requirements – Section 26 05 01

1.02 SUBMITTALS

- A. This Section includes basic materials and methods for application with electrical installations as follows:
 - 1. Raceways
 - 2. Conductor and Cable
 - 3. Boxes and Fittings
 - 4. Wiring Devices
 - 5. Wiring Device Accessories
 - 6. Disconnect Switches.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: NFPA 70; products listed by UL or other agency acceptable to authority having jurisdiction.
- B. NEMA Compliance: Comply with applicable requirements of NEMA Standards

- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards, provide products and components listed or labeled UL, ETL, or CSA

1.04 SEQUENCING AND SCHEDULING

- A. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical components with other Work

PART 2: PRODUCTS

2.01 Raceways:

- A. Rigid Aluminum Conduit: ANSI C80.5.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. PVC Externally Coated Rigid Steel Conduit and Fittings: ANSI C80.1 and NEMA RN 1.
- D. Electrical Metallic Tubing and Fittings: ANSI C80.3.
- E. PVC Externally Coated Electrical Metallic Tubing and Fittings: ANSI C80.3 and NEMA RN 1.
- F. Flexible Metal Conduit: UL 1, zinc-coated steel.
- G. Liquid-tight Flexible Metal Conduit and Fittings: UL 360, Fittings shall be specifically approved for use with this raceway.
- H. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- I. Underground PVC and ABS Plastic Utilities Duct: NEMA TC 6. Type 1 for encased burial in concrete, Type 2 for direct burial,
- J. PVC and ABS Plastic Utilities Duct Fittings: NEMA TC 9; match to duct type and material.
- K. Liquid-tight Flexible Nonmetallic Conduit and Fittings: UL 1660, Fittings shall be specifically approved for use with this raceway.
- L. Conduit, Tubing, and Duct Accessories: Types, sizes and materials complying with manufacturer's published product information, Mate and match accessories with raceway.
- M. Metallic Conduit and Tubing: Use metallic conduit bodies, Use bodies with threaded hubs for threaded raceways.
- N. Conduit Bodies 1 Inch and Smaller: Use bodies with compression-type EMT connectors.

2.02 Conductors and Cables:

- A. General: Provide wire and cable suitable for the temperature, conditions, and location where installed. Ampacities shall be based on a 75°C rating unless equipment and lugs are rated for 90°C use. Provide individual neutral conductors for all circuits. "Shared" or "Common" neutrals shall not be used.
- B. Conductors: Provide solid conductors for power and lighting circuits No. 10 AWG and smaller. Provide stranded conductors for sizes No. 8 AWG and larger.
- C. Conductor Material: Use the following material for sizes indicated.
 - 1. No. 6 AWG and Smaller: Copper.
 - 2. No. 4 AWG and Larger: Copper.
- D. Insulation: Provide XHHW-2 insulation for all conductors size 500 KCM and larger. For all other sizes provide XHHW-2 insulation as appropriate for the locations where installed. Insulation shall be rated 90°C.
- E. Color code secondary service, feeder and branch circuit conductors with factory applied finish as follows:

120/240 Volts	Phase
Black	A
Red	B
White Stripe	Neutral
Green	Ground

Where systems of different voltages are combined in the same junction box or enclosure, the neutral for the 120/240V volt system shall be white with a colored stripe (other than green).

- F. Jackets: Factory-applied XLPE external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90 deg. bends, for pulls in conduits underground or under slabs on grade, and where indicated.
- G. Connectors for Conductors:
 - 1. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used

2.03 Boxes and Fittings:

- A. Rain-tight Outlet Boxes: Provide corrosion-resistant cast-metal rain-tight outlet wiring boxes, of types, shapes, and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configure for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
- B. Junction and Pull Boxes: Provide corrosion-resistant cast, deep type junction and pull boxes, with screw-on/bolt-on covers; of types, shapes, and sizes, to suit each location and installation; with stainless steel nuts, bolts, screws and washers.
- C. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

2.04 WIRING DEVICES

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Provide gray color devices and wall plates except as otherwise indicated. Verify color selections with Owner.
- D. Ground-Fault Interrupter (GFCI) Receptacles: As indicated on drawing; provide "feed-thru" type ground-fault circuit interrupter, with integral indicator light and heavy-duty NEMA 5-20R duplex receptacles arranged to protect connected downstream receptacles on same circuit. Provide unit designed for installation in a 2-3/4-inch-deep outlet box without adapter, grounding type, Class A, Group 1, per UL Standard 94.3.
- F. Plugs: 15-amperes, 125-volts, 3-wire, grounding, armored cap plugs, parallel blades with cord clamp, and 0.4-inch cord hole; match NEMA configuration with power sources.
- G. Plug Connectors: 15-amperes, 125-volts, bakelite-body armored connectors, 3-wire, grounding, parallel blades, double wipe contact, with cord clamp, and 0.4-inch cord hole, match NEMA configuration to mating plugs. Arrange as indicated.
- H. Snap Switches: Quiet type AC switches as indicated on the drawings. Comply with UL 20 and NEMA WD1. Switches shall be gray in color.
- I. Combination Switch and Receptacle: General duty 3-way quiet switch, 20-amperes, 120-277 volts AC, with toggle switch handle, and 3-wire grounding receptacle, 15-amperes, 120-volts, equip with plaster ears, and with break-off tab feature which allows wiring with separate or common feed, with NEMA configuration 5-15R.
- J. Dimmer Switches: Solid state dimmer switches conforming to NEMA WD 1, mounted in outlet boxes as indicated and in accordance with the following:

2.05 WIRING DEVICE ACCESSORIES

- A. Wall plates: Single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which attached. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plate color to match wiring devices except as otherwise indicated. Provide wall plates with engraved legend where indicated. Conform to requirements of Section "Electrical Identification." Provide plates possessing the following additional construction features:
1. Material and Finish: Steel plate, galvanized in unfinished areas.
 2. Material and Finish: Brushed stainless steel in all finished areas.

2.06 CIRCUIT AND MOTOR DISCONNECT SWITCHES, STARTERS AND LIGHTING CONTACTORS

- A. Lighting Contactors: Provide lighting contactors in size and configuration indicated on drawings with the minimum size being 30 amp rated contacts with three poles. Provide with NEMA 1, lockable enclosure unless otherwise indicated. Enclosure shall include a HAND-OFF-AUTO selector switch on the front cover which will close the contacts in the hand position, open in the off position and connect to photocell/DDC system in the auto position. The contactor device shall be mechanically held. Coil voltage shall be 120 volts, 60 HZ unless otherwise indicated. Short circuit rating must be at least 65 KAIC.

PART 3: EXECUTION

3.01 WIRING METHOD

- A. Outdoors: Use the following wiring methods:
1. Exposed: Rigid Galvanized Steel.
 2. Concealed: Intermediate Metal Conduit.
 3. Underground, Concrete Encased: Rigid Galvanized Steel or Schedule 40 PVC Conduit.
 4. Underground, Direct Buried: Rigid Galvanized Steel or Schedule 40 PVC Conduit.
 5. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic, or electric solenoid or motor-drive equipment in moist or humid location or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: liquid-tight flexible metal conduit in lengths not exceeding three (3') feet.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: flexible metal conduit in lengths not exceeding three (3') feet.
2. Exposed: Electrical metallic tubing or rigid aluminum conduit. Type MC cable is allowed behind building finish only.
3. Concealed: Electrical metallic tubing, rigid galvanized steel, type MC cable.
4. Environmental Air Spaces: rigid galvanized steel, or cable assemblies approved for use in environmental air spaces.

3.02 INSTALLATION

A. Raceways: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows:

1. Conceal Conduit and EMT, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes, Install raceways level and square and at proper elevations.
2. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.
3. Complete installation of electrical raceways before starting installation of conductors within raceways.
4. Provide mechanical supports all for raceways. Adhesives shall not be utilized.
5. Prevent foreign matter from entering raceways by using temporary closure protection.
6. Protect stub-ups by using temporary closure protection.
7. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
8. Use raceways fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated.
9. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and

obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

10. Install exposed raceways parallel or perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.
11. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases, provide field bends for parallel raceways.
12. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.
13. Tighten set screws of threadless fittings with suitable tool.
14. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
15. Where terminating in threaded hubs, screw the raceways or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceways so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
16. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
17. Control System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways 2-inch and smaller trade size in maximum lengths of 150 feet and with a maximum of two, 90-deg bonds or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
18. Install raceway sealing fittings in accordance with manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

- a. Where conduits enter or leave hazardous locations.
 - b. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - c. Where required by the NEC.
 - d. Where conduits enter or leave moist or damp spaces, such as crawl spaces or cellars.
19. Stub-up Connections: Extend conduits through concrete for connection to free standing equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with floor.
20. Flexible Connections: Use short length (maximum of 6 ft.) of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid-tight flexible conduit in wet locations. Install separate ground conductor across flexible connections.
21. Do not install aluminum conduit embedded in or in contact with concrete.
22. PVC externally coated rigid steel conduit: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.
- B. Wires and Cables: Install electrical cables, wires, and connectors in compliance with NEC.
 1. Coordinate cable installation with other Work.
 2. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
 3. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
 4. Conceal all cable in finished spaces.
 5. Install exposed cable parallel and perpendicular to surfaces or exposed structural members and follow surface contours.

6. Keep conductor splices to minimum.
 7. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.
 8. Use splice and tap connectors which are compatible with conductor material.
 9. Provide adequate length of conductors within electrical enclosures and trim the conductors to terminal points with no excess. Bundle multiple conductors. Make terminations so there is no bare conductor at the terminal.
 10. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
 12. Cables shall not be bundled with more than 15 cables per bundle. Separate bundles by at least 8". Cables shall be supported with devices designed for the purpose such as a "Caddy" type clips or "J" hooks. Contractor shall not use excess conductors or wiring as supports.
- C. Electrical Boxes and Fittings: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
1. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
 2. Provide weather-tight outlets for interior and exterior locations exposed to weather or moisture.
 3. Provide knockout closures to cap unused knockout holes where blanks have been removed.
 4. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
 5. Do not install aluminum products in concrete. Wall boxes installed in concrete or block shall be made of steel as per this specification.
 6. Position recessed outlet boxes accurately to allow for surface finish thickness.
 7. Do not use round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surfaces.

8. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry,
 9. Provide electrical connections for installed boxes.
 10. Subsequent to installation of boxes, protect boxes from construction debris and damage.
- D. Wiring Devices and Accessories: Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
1. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.
 2. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt, and debris.
 3. Install galvanized steel wall plates in unfinished spaces.
 4. Install wiring devices after wiring work is completed.
 5. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A, use properly scaled torque indicating hand tool.
- 3.03 GROUNDING
- A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.
- 3.04 PROTECTION
- A. Protect installed components from damage. Replace damaged items prior to final acceptance.
- 3.05 ADJUSTING AND CLEANING
- A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.
- 3.06 FIELD QUALITY CONTROL

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.
- B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

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SECTION 26 05 03

MINOR ELECTRICAL DEMOLITION

PART 1: : GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled located as shown; removal of designated construction; dismantling, cutting and alterations for completion of the Work. This includes but not limited to enclosures, lighting fixtures, poles, conduits, conductors and ballasts.
 - 2. Remove all but not limited to fixtures, conduits, wiring, devices, and all other associated devices as indicated on drawings. Do not reuse devices unless specifically indicated.
 - 3. Legal Disposal of materials.
 - 4. Storage of removed materials.
 - 5. Identification of utilities.
 - 6. Salvaged items. Certain items as indicated on drawings such as but not limited to lighting fixtures, pull stations are to be removed and stored in location protected from damage for reinstallation. Contractors shall be responsible to replace any devices that are no longer functional or damaged during demolition.
 - 7. Protection of items to remain as indicated on Drawings.
 - 8. Relocate existing equipment to accommodate construction.
- B. Related Sections:
 - 1. Section 02 41 13 – SELECTIVE DEMOLITION
 - 2. Section 31 10 00 - SITE PREPARATION for site clearing and removal of above and below-grade improvements.

1.02 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work. Describe demolition removal procedures and schedule.

1.03 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Requirements for submittals.

- B. Project Record Documents: Record actual locations of capped utilities, conduits and equipment abandoned in place and other items associated to scope of work.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with the State of Massachusetts and local Municipal standards.

1.05 PRE-INSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site to review methods and procedures related to selective demolition including, but not limited to, the following:
- B. Convene minimum one week prior to commencing work of this section.

1.06 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.

1.07 SCHEDULING

- A. Schedule work to coincide with new construction.
- B. Cease operations immediately when structure appears to be in danger and notify Engineer. Do not resume operations until directed.

1.08 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Conduct demolition to minimize interference with adjacent and occupied building areas.
- C. Coordinate demolition work with Owner.
- D. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
- E. Shut-down Periods:
 - 1. Arrange timing of shut-down periods of in-service panels with Owner. Do not shut down any utility without prior written approval.
 - 2. Keep shut-down period to minimum or use intermittent period as directed by Owner.
- F. Identify salvage items in cooperation with Owner.

- G. Coordinate disruption of power with owner in advance to minimize effect on construction and on other trades
- H. Equipment locations and call-outs shown on Drawings have been obtained from casual field observation and should be considered approximate, Electrical contractor shall field verify existing conditions prior to commencement of work
- I. All lighting fixtures, receptacles, and any other electrical equipment not scheduled for removal, refurbishing or recircuiting shall be left energized.
- J. De-energize, remove and dispose of all wiring associated with demolition. Any concealed wiring which cannot be removed under limits of demolition shall be rendered unusable at both ends and abandoned in place

PART 2: PRODUCTS
Not Used

PART 3: EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
- C. Verify termination points for demolished services.

3.02 PREPARATION

- A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
- B. Temporary egress signage and emergency lighting

3.03 DEMOLITION

- A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

- C. Remove conduit, wire, boxes, and fastening devices to avoid any interference with new installation.
- D. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- E. Reconnect equipment being disturbed by renovation work and required for continue service to nearest available panel or as indicated on drawings.
- F. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.
- G. Install temporary wiring and connections to maintain existing systems in service during construction.
- H. Perform work on energized equipment or circuits with experienced and trained personnel.
- I. Remove, relocate, and extend existing installations to accommodate new construction.
- J. Repair adjacent construction and finishes damaged during demolition and extension work.
- K. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components, including abandoned components above accessible ceiling finishes. Cut embedded support elements flush with walls and floors.
- L. Clean and repair existing equipment to remain or to be reinstalled.
- M. Protect and retain power to existing active equipment remaining.
- N. Cap abandoned empty conduit at both ends.
- O. Perform Work in accordance with the State of Massachusetts and local Municipal standards.

3.04 UTILITY SERVICES

- A. Existing Utilities: Maintain adjacent services and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least seventy-two (72) hours' notice to Owner if shutdown of service is required during changeover.

3.05 EXISTING PANELBOARDS

- A. Ring out circuits in existing panel affected by the Work.
- B. Tag circuits and note breakers type and style.
- C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.
- D. Remove existing wire no longer in use from panel to equipment.
- E. See plans for panel modifications, provide new updated directories where circuits have been modified or rewired.

3.06 SALVAGE ITEMS

- A. Remove and protect items indicated on Drawings to be salvaged and turn over to Owner.
- B. Items of salvageable value may be removed as work progresses. Transport salvaged items from site as they are removed.

3.07 REUSABLE ELECTRICAL EQUIPMENT

- A. Carefully remove equipment, materials, or fixtures which are to be reused.
- B. Disconnect, remove, or relocate existing electrical material and equipment interfering with new installation.
- C. Relocate existing lighting fixtures as indicated on Drawings. Clean fixtures and re-lamp. Test fixture to see if it is in good working condition before installation at new location.

3.08 CLEANING

- A. Section 01 70 00 - Execution Requirements: Requirements for cleaning.
- B. Remove demolished materials as work progresses. Legally dispose.
- C. Keep workplace neat.

3.09 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution Requirements: Requirements for protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.

END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.

1.03 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.
- C. XLPE: Cross-linked polyethylene.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.06 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2: PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. American Insulated Wire Corp.; a Leviton Company.
 2. General Cable Corporation.
 3. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types RHW-2.

2.02 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.
 4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3: EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. All Exposed Branch Circuits: Type XHHW-2, single conductors in raceway
- B. All Branch Circuits Underground: Type XHHW-2, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- D. Identify and color-code conductors and cables.

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least **6 inches** of slack.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- B. Underground Exterior-Wall Penetrations: Install RGS for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.06 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.07 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Rod electrodes.
 - 2. Active electrodes.
 - 3. Wire.
 - 4. Exothermic connections.

1.02 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code 2017

1.03 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
 - 1. Metal building frame.
 - 2. Concrete-encased electrode.
 - 3. Rod electrode.
 - 4. Plate electrode.

1.04 DESIGN REQUIREMENTS

- A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100. Refer to Section 010270.

1.05 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms maximum.

1.06 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Installation Instructions: Submit for active electrodes.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.07 CLOSEOUT SUBMITTALS

- A. Section 017000 - Execution Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.

1.08 QUALITY ASSURANCE

- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.
- B. Perform Work in accordance with the State of Massachusetts and local Municipal standards.
- C. Maintain one copy of each document on site.

1.09 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 5 years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.10 PRE-INSTALLATION MEETINGS

- A. Section 01300 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
- D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.12 COORDINATION

- A. Section 013000 - Administrative Requirements: Requirements for coordination.
- B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 PRODUCTS

2.01 ROD ELECTRODES

- A. Manufacturers:
 - 1. Apache Grounding/Erico Inc.
 - 2. Copperweld, Inc.
 - 3. Erico, Inc.
 - 4. O-Z Gedney Co.
 - 5. Thomas & Betts, Electrical
 - 6. Substitutions: Section 016000 - Product Requirements
- B. Furnish materials in accordance with the State of MASSACHUSETTS and local Municipal standards.
- C. Product Description:
 - 1. Material: Copper or clad steel.
 - 2. Diameter: 3/4 inch.
 - 3. Length: 10 feet.
- D. Connector: Connector for exothermic welded connection if below grade.

2.02 ACTIVE ELECTRODES

- A. Manufacturers:
 - 1. Apache Grounding/Erico Inc.
 - 2. Copperweld, Inc.
 - 3. Erico, Inc.
 - 4. O-Z Gedney Co.
 - 5. Thomas & Betts, Electrical
 - 6. Substitutions: Section 016000 - Product Requirements

- B. Furnish materials in accordance with the State of MASSACHUSETTS and local Municipal standards.
- C. Product Description:
 - 1. Material: Metallic-salt-filled copper-tube electrode.
 - 2. Shape: As indicated on Drawings.
 - 3. Length: As indicated on Drawings Connector: Connector for exothermic welded connection.

2.03 WIRE

- A. Material: Stranded copper.
- B. Bonding Conductor: Copper conductor insulated with green or green with yellow strip jacket or Bare copper. Size per NEC 250-94 and 250-95

2.04 MECHANICAL CONNECTORS

- A. Manufacturers:
 - 1. Apache Grounding/Erico Inc.
 - 2. Copperweld, Inc.
 - 3. Erico, Inc.
 - 4. ILSCO Corporation.
 - 5. O-Z Gedney Co.
 - 6. Thomas & Betts, Electrical
 - 7. Substitutions: Section 01600 - Product Requirements.
- B. Furnish materials in accordance with the State of MASSACHUSETTS and local Municipal standards.
- C. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.05 EXOTHERMIC CONNECTIONS

- A. Manufacturers:
 - 1. Apache Grounding/Erico Inc.
 - 2. Cadweld, Erico, Inc.
 - 3. Copperweld, Inc.
 - 4. ILSCO Corporation.
 - 5. O-Z Gedney Co.
 - 6. Thomas & Betts, Electrical.
 - 7. Substitutions: Section 01600 - Product Requirements.
- B. Furnish materials in accordance with the State of MASSACHUSETTS and local Municipal standards. Comply with AWS Code for procedures, appearance, and quality of welds; and for methods used in correcting welding work.

- C. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify final backfill and compaction has been completed before driving rod electrodes.

3.02 PREPARATION

- A. Remove paint, rust, mill oils and surface contaminants at connection points.

3.03 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods compatible with existing electrical installations, or as specified.

3.04 INSTALLATION

- A. Install in accordance with IEEE 142 and 1100.
- B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground. (Two rods minimum)
- C. Install grounding and bonding conductors concealed from view.
- D. Bond together metal siding not attached to grounded structure; bond to ground.
- E. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Install 2 AWG bare copper bonding conductor.
- F. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Connect to site grounding system. Refer to Section 02590.

- H. Permanently ground entire light system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- I. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
- J. Permanently attach equipment and grounding conductors prior to energizing equipment.
- K. All equipment grounding conductors shall be insulated copper with green jacket or green with yellow stripe. Conductors smaller than #4 shall not be re-marked per the NEC.
- L. Conduits and MC type cable jackets shall not be used in lieu of dedicated grounding conductors. All feeders shall have a separate dedicated grounding conductor.
- M. All exterior connections shall be performed using an approved exothermic process.
- N. Weld grounding conductors to underground grounding electrodes.
- O. Install Work in accordance with the State of MASSACHUSETTS and local Municipal standards.

3.05 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements and 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground resistance testing in accordance with IEEE 142.
- E. Perform continuity testing in accordance with IEEE 142.
- F. When improper grounding is found on receptacles, check receptacles and correct. Perform retest.

END OF SECTION

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbank systems, manholes, and underground utility construction.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. NBR: Acrylonitrile-butadiene rubber.
- H. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, pull boxes, hinged-cover enclosures, and cabinets.

- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. For handholes and boxes for underground wiring, including the following:
 - a. Duct entry provisions, including locations and duct sizes.
 - b. Frame and cover design.
 - c. Grounding details.
 - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
 - e. Joint details.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Source quality-control test reports.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2: PRODUCTS

2.01 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 2. O-Z Gedney; a unit of General Signal.
 - 3. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.

- E. EMT: ANSI C80.3.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel or die-cast compression type.
 - 2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- H. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. CANTEX Inc.
 - 3. CertainTeed Corp.; Pipe & Plastics Group.
 - 4. Condux International, Inc.
 - 5. RACO; a Hubbell Company.
 - 6. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.03 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.

- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 when located in 3R enclosure, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type or Screw-cover type
- E. Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson.
 - 3. Hoffman.
 - 4. Hubbell Incorporated.
 - 5. O-Z/Gedney
 - 6. RACO; a Hubbell Company.
 - 7. Thomas & Betts Corporation.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

2.05 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
 - 1. Color of Frame and Cover: Gray.
 - 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
 - 3. Cover: Weatherproof, secured by tamper-resistant locking devices, 3/8"-16 UNC x 2-1/4" L.G, S.S. captive head bolts with S.S. flat washers, Minimum two locations and having structural load rating consistent with enclosure.
 - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50, "MS-86".
 - 5. Cover Legend: Molded lettering, "LIGHTING" City Standard handholes shall be "LIGHTING" with 3" letters.

6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes with interior dimensions of 12 inches wide by 24 inches long and larger shall have inserts for cable supports.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation, Hubbell.
 - d. Quazite, Hubbell

2.06 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

2.07 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Plastic or Stainless steel. Include two for each sealing element.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.08 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3: EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 1. Exposed Conduit: Rigid steel conduit were susceptible to damage, RNC, Type EPC-80-PVC.
 2. Concealed Conduit, Aboveground: Type EPC-80-PVC.
 3. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.
 4. Boxes and Enclosures, Exposed Aboveground: NEMA 250, Type 4.
 5. Application of Handholes and Boxes for Underground Wiring:
 - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 22 structural load rating.
 - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: RNC.
 2. Exposed, Not Subject to Severe Physical Damage: RNC identified for such use.
 3. Exposed and Subject to Physical Damage: Rigid steel conduit.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

- C. Minimum Raceway Size: **1-inch** trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass-through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits in contact with concrete.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from RNC, Type EPC-80-PVC, to rigid steel conduit, before rising above the floor.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- L. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.
 - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: **125 deg F** temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: **155 deg F** temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: **125 deg F** temperature change.
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
 - 2. Install backfill.
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final

- conduit connection at end of run and complete backfilling with normal compaction
4. Install manufactured duct elbows for stub-ups at poles and equipment and at electrical service equipment through the floor/wall, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at electrical equipment entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
 6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below the frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of steel, concrete and masonry.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint.
- I. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- J. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.06 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.07 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Identification for raceway.
 - 2. Identification for conductors and control cable.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.03 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.04 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

1.05 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2: PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
 - 1. Power Circuits: Black letters on a yellow/orange field.
 - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.02 CONDUCTOR CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

2.03 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.04 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).
- C. Warning label and sign shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.05 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.06 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 1. Minimum Width: 3/16 inch.

2. Tensile Strength: 50 lb, minimum.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.
1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
 - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior concrete and masonry primer.
 - 2) Finish Coats: Exterior semigloss acrylic enamel.
 2. Exterior Ferrous Metal:
 - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior ferrous-metal primer.
 - 2) Finish Coats: Exterior semigloss alkyd enamel.
 3. Interior Ferrous Metal:
 - a. Semigloss Acrylic-Enamel Finish: **Two** finish coat(s) over a primer.
 - 1) Primer: Interior ferrous-metal primer.
 - 2) Finish Coats: Interior semigloss acrylic enamel.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3: EXECUTION

3.01 APPLICATION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits: Identify with orange snap-around label and self-adhesive vinyl tape applied in bands.
- B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
 1. Mechanical and Electrical Supervisory System: Green and blue.
 2. Control Wiring: Green and red.
- C. Power-Circuit Conductor Identification: For conductors in pull and junction boxes, manholes, and handholes use color-coding conductor tape and wraparound marker

labels. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape, wraparound marker labels, or metal tags. Identify each ungrounded conductor according to source and circuit number.
- E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source and circuit number.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, and control wiring and. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
 - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- I. Instruction Signs:
 - 1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment,

central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where 2 lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.
 - c. Disconnect switches.
 - d. Contactors.
 - e. Control equipment.

3.02 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded branch-circuit conductors.
 1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.

2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
- J. Painted Identification: Prepare surface and apply paint.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes distribution and branch circuit panelboards and load centers.
- B. Related Sections:
 - 1. Section 26 05 26 - Grounding and Bonding.
 - 2. Section 26 05 53 - Electrical Identification
- C. Provide new panelboards as indicated on the drawings. Provide circuit breakers and other modifications to existing panelboards as indicated.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
 - 4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
 - 5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 6. NEMA PB 1 - Panelboards.
 - 7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code 2005.
- E. Underwriters Laboratories Inc.:
 - 1. UL 67 - Safety for Panelboards.
 - 2. UL 1283 - Electromagnetic Interference Filters.
 - 3. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Product Data: Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 78 90 - Closeout Submittals: Requirements for submittals.
- B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- C. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution Requirements and 01 78 20- Operation and Maintenance Data: Requirements for maintenance products.
- B. Furnish two of each panelboard key. Panelboards keyed alike.

PART 2 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

- A. Manufacturers:
 - 1. GE Electrical.
 - 2. EATON – Cutler Hammer
 - 3. Siemens.
- B. Product Description: NEMA PB 1, circuit breaker type panelboard or as indicated. Furnish combination controllers as indicated on Drawings.
- C. Service Conditions:

1. Temperature: 104 degrees F (40 degrees C).
 2. Altitude: 6000 feet (1830 m) above sea level.
 3. Exposure to corrosive or explosive fumes, exposure to dust or vapors, abnormal vibration, or unusual operating duties. Consult NEMA PB 1 for additional information.
- D. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- E. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical.
- F. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R or J fuses, or as indicated on Drawings.
- G. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Breakers shall have a minimum 22,000 RMS symmetrical interrupting rating as indicated on the drawings for each specific panelboard.
- H. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, bolt-on type, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. Breakers shall have a minimum 22,000 RMS symmetrical interrupting rating as indicated on the drawings for each specific panelboard.
- I. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, bolt-on type, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
- J. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.
- K. Enclosure: NEMA PB 1, Type 3R or as indicated on drawings. Dimensions as per manufacturer's standards.
- L. Cabinet Front: Surface door-in-door type, fastened with hinged door with flush lock, finished in manufacturer's standard gray enamel. Provide with "trim" hinge.

2.2 BRANCH CIRCUIT PANELBOARDS

- A. Manufacturers:
1. GE Electrical.

2. EATON – Cutler Hammer
 3. Siemens.
- B. Product Description: NEMA PB1, circuit breaker type, lighting, and appliance branch circuit panelboard.
- C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard; furnish insulated ground bus as indicated on Drawings.
- D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.
- E. Minimum Integrated Short Circuit Rating: Breakers shall have a minimum 22,000 amps RMS symmetrical interrupting rating as indicated on the drawings for each specific panelboard.
- F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers. Breakers shall have a minimum 22,000 amps RMS symmetrical interrupting rating as indicated on the drawings for each specific panelboard.
- G. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, bolt-on type, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
- H. Enclosure: NEMA PB 1, Type 1, or as indicated on Drawings.
- I. Cabinet Box: Dimensions as per manufacturer's standards.
- J. Cabinet Front: Flush or Surface cabinet front, or as indicated on drawings, with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Disconnect abandoned panelboards and load centers. Remove abandoned panelboards and load centers.
- B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide new panel.

- C. Clean and repair existing panelboards and load centers to remain or to be reinstalled as indicated. Provide and install new breakers where indicated. Provide and install new ground bus where indicated. Provide and install new covers where indicated.

3.2 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb.
- C. Install recessed panelboards flush with wall finishes.
- D. Height: 6 feet (1800 mm) to top of panelboard and load center; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.
- E. Install filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads.
- G. Install engraved plastic nameplates in accordance with Section 26 05 02.
- H. Install spare conduits out of each recessed panelboard to accessible location above ceiling or below floor or as indicated on drawings. Minimum spare conduits: 3 empty 1.5 inch (DN27). Identify each as SPARE.
- I. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with NFPA 70.
- J. Provide panelboards, constructed for special use, with appropriate UL markings which indicate that they are suitable for special type of use/application. Main distribution panelboards shall be marked as service entrance rated.
- K. Provide a 3/4" minimum thickness backboard of adequate size painted with 2 coats of white enamel paint for surface mounted panelboards.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services and 01 70 00 - Execution Requirements: Testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

- E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.4 ADJUSTING

- A. Section 01 70 00 - Execution Requirements and 01 75 00 - Starting and Adjusting: Requirements for starting and adjusting.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

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SECTION 26 27 26

WIRING DEVICES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches.

1.03 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- C. TVSS: Transient voltage surge suppressor.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.02 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; HBL5351 (single), CR5352 (duplex).
 - b. Leviton; 5891 (single), 5352 (duplex).
 - c. Pass & Seymour; 5351 (single), 5352 (duplex).

2.03 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Cooper; SGF20.
 - b. Pass & Seymour; 2084.
 - c. Hubbell
2. Duplex GFCI Convenience Receptacles located in damp and wet locations shall be weather-resistance (WR) per NEC 406.9.

2.04 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eaton; B1221 (single pole).
 - b. Hubbell; CS1221 (single pole).
 - Leviton; 1221-2 (single pole).
 - Legrand - Pass & Seymour; 20AC1 (single pole).

2.05 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Unfinished Spaces: Steel plate, galvanized in unfinished areas.
 3. Material for Finished Spaces: Brushed stainless steel in all finished areas.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof in-use Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.06 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: Black, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- C. Device Installation:
 - 1. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 2. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 3. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 4. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 5. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 6. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 7. Tighten unused terminal screws on the device.
 - 8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with **black**-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

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SECTION 26 56 19

LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 262416 "Panelboards" for panelboard-based lighting control.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of the following:
 1. Luminaire.
 2. Photoelectric relay.
- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. UL Compliance: Comply with UL 1598 and listed for wet location.
- D. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- E. Site Lighting: CRI of minimum 70 CCT of 3000 K.
- F. L70 lamp life of 70,000 hours minimum.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Nominal Operating Voltage: 120 V AC.
- I. In-line Fusing: Separate in-line fuse for each luminaire – Use UL listed waterproof breakaway style fuse kits for conductors.
- J. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.
- K. Source Limitations:
 1. Obtain luminaires from single source from a single manufacturer.
 2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

- A. See Luminaire Schedule on the contract drawings.

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- E. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- F. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Color: **Black**
- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color:

- 1) As selected from manufacturer's standard catalog of colors.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Verify LED operation in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning.
 3. Support luminaires without causing deflection of finished surface.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- H. Coordinate layout and installation of luminaires with other construction.
- I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Aim as indicated on Drawings.

- B. Install as indicated on the contract drawings.

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with ~~0.010-inch-~~ (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES RP-6-20.
 - c. IES LM-64.
 - d. IES RP-8-21.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 26 56 19

SECTION 26 56 68
EXTERIOR ATHLETIC LIGHTING

265668.1	SPORTS LIGHTING SYSTEM	LUMP SUM
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PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes lighting for the following outdoor sports venues, specified primarily by illumination performance:
 - 1. Soccer Fields.
 - 2. Softball
- B. Control and Monitoring: Provide remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

1.03 DEFINITIONS

- A. CV: Coefficient of variation; a statistical measure of the weighted average of all relevant illumination values for the playing area, expressed as the ratio of the standard deviation for all illuminance values to the mean illuminance value.
- B. Delegated-Design Submittals: Documents, including drawings, calculations, and material and product specifications prepared as a responsibility of Contractor to obtain acceptance by Owner and authorities having jurisdiction.
 - 1. Horizontal Illuminance: Measurement in foot-candles (lux), on a horizontal surface 36 inches (915 mm) above ground, unless otherwise indicated.
 - 2. LLD: Lamp lumen depreciation.
 - 3. LLF: Light loss factor.
 - 4. Luminaire: Complete lighting fixture, including ballast housing if provided.
 - 5. Target Illuminance: Average maintained illuminance level, calculated by multiplying initial illuminance by LLF.
 - 6. UG: Uniformity gradient; the rate of change of illuminance on the playing field, expressed as a ratio between the illuminances of adjacent measuring points on a uniform grid.

7. Vertical Illuminance: Measurement in foot-candles (lux), in two directions on a vertical surface, at an elevation coinciding with plane height of horizontal measurements.

1.04 PERFORMANCE REQUIREMENTS

- A. Facility Type: Recreational or social facility.
- B. Illumination Criteria: Comply with criteria in IESNA RP-6 for the following:
 1. Minimum average maintained illuminance level for each lighted area for each sports venue and for the indicated class of play.
 2. CV and maximum-to-minimum uniformity ratios for each lighted area equal to or less than those listed in IESNA RP-6 for the indicated class of play.
 3. UG levels within each lighted area and between adjacent lighted areas equal to or less than those listed in IESNA RP-6 for the indicated speed of sport.
- C. Illumination Calculations: Computer-analyzed point method complying with IESNA RP-6 to optimize selection, location, and aiming of luminaires.
 1. Grid Pattern Dimensions: For playing areas of each sport and areas of concern for spill-light control, correlate and reference calculated parameters to the grid areas and intersection points of the indicated grid pattern.
 2. Spill-Light Control: Minimize spill light for each playing area on adjacent and nearby areas.
 3. Prevent light trespass on properties near Project as defined by authorities having jurisdiction.
 4. Glare Control: Design illumination for each playing area to minimize direct glare in adjacent and nearby areas.
 5. Determine LLF according to IESNA RP-6.
 6. Luminaire Mounting Height: Comply with recommendations in IESNA RP-6, with consideration for requirements to minimize spill light and glare.

# of Poles	Pole Designation	Pole Height
2	A1 and A2	60'
2	B1 and B2	60'
2	C1 and C2	80'

7. Ball Field:
 - a. IESNA RP-6, Class of Play: IV.
 - b. Grid Pattern Dimensions: 20 by 20 feet, with min 271 grid points.

9. Electric Power Distribution Requirements:
- a. Electric Power: 240 V, 1 phase.
 - b. Balance load between phases. Install wiring to balance three phases at each support structure.
 - c. Include required overcurrent protective devices and individual lighting control for each sports field or venue.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Infield	30FC	2.5:1	25	20' x 20'
Outfield	20FC	3:1	94	20' x 20'
Soccer	22.3fc	4.4:1	271	20' x 20'

1.05 ENVIRONMENTAL LIGHT CONTROL

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

150' From the Edge of the Field	Maximum
Horizontal Footcandles	< .16 FC

- C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.
- D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

1.06 SUBMITTALS

- A. Product Data: For each type of lighting product; include the following:
 - 1. Lamp life, output, and energy-efficiency data. Energy data shall comply with IESNA LM-47.
 - 2. Photometric data based on laboratory tests of each luminaire type, complete with lamps, ballasts, and accessories.
 - 3. Photometric data shall be certified by either a qualified independent testing agency or manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Submittals: The following documents:
 - 1. Drawings and specifications for construction of lighting system.
 - 2. Manufacturer's determination of LLF used in design calculations.
 - 3. Structural analysis data and calculations used for pole selection.
 - a. Manufacturer Seismic Qualification Certification: Submit certification that sports lighting components and their mounting and anchorage provisions are designed to remain in place without separation of any parts when subjected to the seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:
 - i. Basis for Certification: Indicate whether withstand certifications are based on actual test of assembled components or on calculation.
 - b. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, complies with AASHTO LTS-6 for location of Project.
 - 4. Design calculations for the following:

- a. Target illuminance.
 - b. Point calculations of horizontal and vertical illuminance, CV, and UG at minimum grid size and area.
 - c. Point calculations of horizontal and vertical illuminance in indicated areas of concern for spill light.
 - d. Calculations of source intensity of luminaires observed at eye level from indicated properties nearby the playing fields.
 - e. Short-circuit current calculations for rating of panelboards.
 - f. Total connected and estimated peak-demand electrical load, in kilowatts, of lighting system.
 - g. Capacity of feeder required to supply the lighting system.
 - 5. Wiring requirements, including required conductors and cables and wiring methods.
 - C. Manufacturer Certificates: Signed by manufacturers certifying that support structures, including brackets, arms, appurtenances, bases, anchorages, and foundations, comply with requirements.
 - 1. Field quality-control test reports.
 - 2. Operation and Maintenance Data: For sports lighting system components to include in operation, and maintenance manuals.
 - 3. Warranty: Special warranty specified in this Section.
- 1.07 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - B. Manufacturer Qualifications: A qualified manufacturer. With a service center capable of providing training, parts, and emergency maintenance repairs.
 - C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- 1.08 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of luminaires, lamps, and luminaire alignment products and to correct misalignment that occurs subsequent to successful acceptance tests. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, and unauthorized repairs and alterations from special warranty coverage.
 - 1. Luminaire Warranty: Luminaire and luminaire assembly shall be free from defects in materials and workmanship for a period of five years from date of Substantial Completion.

2. Alignment Warranty: Accuracy of alignment of luminaires shall remain within specified illuminance uniformity ratios for a period of five years from date of successful completion of acceptance tests.
 - a. Realign luminaires that become misaligned during the warranty period.
 - b. Replace alignment products that fail within the warranty period.
 - c. Verify successful realignment of luminaires by retesting as specified in Part 3 "Field Quality Control" Article.

PART 2: PRODUCTS

2.01 LUMINAIRES, LAMPS, AND DRIVERS

- A. Luminaires: Listed and labeled, by an NRTL acceptable to authorities having jurisdiction, for compliance with UL 1598 for installation in wet locations.
 1. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without using tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent their accidental falling during relamping and when secured in operating position. Door shall be removable for cleaning or replacing lens.
 2. Exposed Hardware: Stainless-steel latches, fasteners, and hinges.
 3. Spill-Light Control Devices: Internal louvers and external baffles furnished by manufacturer and designed for secure attachment to specific luminaire.
- B. Ballast/Drivers Mounting: Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.
- C. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002
- D. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment

2.02 SUPPORT STRUCTURES

- A. Support-Structure Wind-Load Strength: Poles and other support structures, brackets, arms, appurtenances, bases, anchorages, and foundations shall comply with AASHTO LTS-4 and shall be certified by manufacturers to withstand steady winds up to 150 mph with a gust factor of 1.3 without permanent deflection or whipping.
- B. Support-Structure Seismic Strength: Poles or other support structures, brackets, arms, appurtenances, base, anchorage, and foundation shall be designed to

prevent separation of components or fracture of poles, luminaire supports, or pole foundations during a seismic event.

C. Mountings, Fasteners, and Appurtenances:

1. Corrosion resistant, compatible with support components, and shall not cause galvanic action at contact points.
 - a. Steel Components: Hot-dip galvanized after fabrication, complying with ASTM A 123/A 123M.
 - b. Mounting Hardware Fasteners: Hot-dip galvanized, complying with ASTM A 153/A 153M.

D. Concrete for Pole Foundations: 3000-psi, 28-day minimum compressive strength. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Concrete specified for early pole erection.

1. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
 - a. Integrated grounding via concrete encased electrode grounding system.

E. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

2.03 POLE AND BASE PROTECTION

- A. Pole Pads: Wraparound pad, with 4 inches of extra-firm polyfoam, 360-degree coverage of ground-mounted poles and supports, continuous hook-and-loop fastening, and not less than 72 inches high.

2.04 CONTROL

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming with be set via scheduling options (Website, app, phone, fax, email).
- D. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling

capabilities for all fields to only having permission to execute "early off" commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

- E. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- F. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

 - 1. Cumulative hours: shall be tracked to show the total hours used by the facility
 - 2. Report hours saved by using early off and push buttons by users.
- G. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- H. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Use web fabric slings (not chain or cable) to raise and set structural members.
- B. Install poles and other structural units level, plumb, and square.
- C. Except for embedded structural members, grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole. Nonshrink grout is specified in Division 05 Section "Metal Fabrications."
- D. Baffles and Louvers for Spill-Light Correction: Install on luminaires with fasteners provided by manufacturer.
- E. Install controls and ballast/driver housings in cabinets mounted on support structure at least 10 feet above finished grade.

3.02 FIELD QUALITY CONTROL

- A. Perform the following field quality-control tests, inspections, and analysis according to IESNA RP-6 and IESNA LM-5, where applicable, and prepare test reports:

1. After installing sports lighting system and after electrical circuits have been energized, perform proof-of-performance field measurements and analysis for compliance with requirements.
 2. Playing and Other Designated Areas: Make field measurements at intersections of grids, dimensioned and located as specified in Part 1 "Performance Requirements" Article and as described below.
 - a. Ball Field. Measure at least 25 points in field and 70 point outfield.
 - B. Make field measurements at established test points in areas of concern for spill light and glare.
 - C. Perform analysis to demonstrate correlation of field measurements with specified illumination quality and quantity values and corresponding computer-generated values that were submitted with manufacturers documents, and submit a report of the analysis.
 - D. Correction of Illumination Deficiencies for Playing Areas: Make corrections to illumination quality or quantity measured in field quality-control tests that vary from specified illumination criteria by plus or minus 10 percent or more; add or replace luminaires, or change mounting height, revise aiming, or install louvers, shields, or baffles. If luminaires are added or mounting height is changed, revise aiming and recalculate and modify or replace support structures, if indicated. Retest as specified above after repairs, adjustments, or replacements are made. Report results in writing.
- 3.03 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sports lighting. Refer to Division 01 Section "Demonstration and Training."
- 3.04 WARRANTY AND GUARANTEE
- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
 - B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

PART 4: DESIGN APPROVAL

4.01 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

- A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco's Light-Structure System with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.
- D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

PART 5 - COMPENSATION

Item 265668.1 – SPORTS LIGHTING SYSTEM

METHOD OF MEASUREMENT:

The Exterior Athletic Lighting, including Poles, Fixtures, and controls panels, to be paid for under this item shall be a lump sum for and include all required equipment and accessories, installed, connected, tested, and accepted as a complete ready for operation and accepted as satisfactory by the Engineer.

METHOD OF PAYMENT:

Payment shall be based on the unit price bid for this item. The unit price shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work and construction methods for the completion of Electrical. This work includes, but is not limited to, the scope of work described in Division 26, or as otherwise required by the Owner's Representative.

END OF SECTION

SECTION 31 00 00
EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All Work performed under this Section shall be subject to the General Conditions, Supplementary Conditions of the Contract, and Division 1 General Requirements.
- B. The geotechnical report provided by Geotechnical Services Inc. shall be considered part of this Earthwork Specification.
- C. Provide all facilities, labor, materials, tools, equipment, transportation, supervision, and related work necessary to complete the Work specified in this Section, and shown on the Drawings.
- D. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Section.
- E. Coordinate Work with that of all other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under the Contract.

1.02 SCOPE OF WORK

- A. The scope of work described herein without limiting the generality thereof, consists of furnishing and installing the following items of work and related items incidentally thereto as shown on the Drawings and as specified herein:
 - 1. Prepare the site for construction activities by clearing, grubbing, and disposing of all vegetation as indicated on the Drawings.
 - 2. Protection and preservation of existing foundations, roadways and parking areas, existing athletic fields, existing utilities, Owner, Owner's Representative, and the general public from damage or injury during conduct of the work, including but not limited to machinery use and movements, runoff, siltation, dust, and/or excessive noise or ground vibrations.
 - 3. Excavate all materials, including soils, boulders, abandoned utilities, structures, foundations, pavements, curbs and all other materials and obstructions as necessary to install new utilities, pavements, construct new natural grass field and associated equipment and other site improvements indicated on the Drawings.
 - 4. Provide adequate dust control and maintain adjacent streets and sidewalks in a clean and unencumbered state over the full duration of the project.

5. Handling, processing, re-handling, segregating, and stockpiling materials during the course of the Work. Existing on-site materials may require processing prior to reuse. Processing may include crushing, blending, screening, drying, and other measures to meet the requirements herein and as directed by the Engineer.
6. Remove and legally dispose off-site of all at-grade and below grade structures including buried foundations, utilities, pavements, and other buried structures.
7. Provide, place, moisture condition, compact, and grade fill and other materials to the horizontal and vertical limits to construct the proposed site improvements and achieve the lines and grades as shown on the Drawings.
8. Trench excavation, bedding and backfill for all structures, foundations, and utilities, including compaction.
9. Furnishing, designing and installing all temporary sheeting, shoring, and bracing of excavations, including trenches, to permit safe access as required and to prevent damage to completed portions of the Work or existing structures.
10. Furnish from approved borrow source(s) fill or backfill materials for placement and compaction on-site as required to complete the work of this Section. Provide specified materials from off-site sources as required.
11. Dewatering as necessary to control precipitation and run-off to allow all work to be conducted in the dry. Construct recharge structures as necessary to recharge all collected dewatering effluent on the project site as necessary to:
 - a. Provide erosion control measures during the Work and control surface runoff.
 - b. Maintain a dry and stable subgrade for final excavations, natural grass field subgrade preparation, foundation construction and backfilling.
 - c. Control and remove seepage, groundwater, and surface water in the excavations in order to maintain a dry and stable subgrade.
12. The Contractor shall be solely responsible for all aspects of site safety. The Contractor shall implement all measures required by OSHA, or other agency having jurisdiction over the Work, to protect the health and safety of the Contractor's personnel, other personnel on-site, and the general public from hazards associated with the Work.
13. Perform all Work in accordance with all federal, state, county, local, and city agencies and authorities having jurisdiction over the Work. All Work

performed under this section shall conform to the latest edition of appropriate codes, standards and regulations.

1.03 RELATED SECTIONS AND DOCUMENTS

- A. Carefully examine all of the Contract Documents for requirements which affect the Work of this Section.
- B. Prior to submitting a bid for the Work, the Contractor shall review and become familiar with the following document(s), which describe site and subsurface conditions at the site. These documents are included in the Project Manual.
 - 1. Geotechnical Report Test for "Arlington Light Pole Foundations" by Geotechnical Services Inc. dated November 19th 2021.

1.04 DEFINITIONS AND REFERENCE STANDARDS

- A. Owner's Representative: Stantec Planning and Landscape Architecture
- B. Engineer: Authorized Representative(s) of the Owner
- C. Owner: Town of Arlington Recreation Department
- D. Contractor: The person or organization identified in the Agreement as being responsible for the work under this Section. The term Contractor shall also refer to an authorized representative of the Contractor.
- E. Earthwork is all excavation, handling, conditioning, and backfilling operations of all soil, boulders, and other materials for new below-grade construction and site development, including obstructions and utility relocation and construction, regardless of the nature of the material encountered, the water content thereof, and type of equipment required for excavation.
- F. Subgrade Elevation or Level is the vertical excavation level and slopes indicated on the Drawings to which the excavation shall be conducted. For foundation bearing subgrades, this level will be to the elevations indicated on the Drawings.
- G. Zone of Influence is the zone beneath a structure or utility defined by imaginary lines extending outward 2 ft laterally beyond the bottom edge of a footing or slab or from the springline of a utility and down on a one horizontal to one vertical (1H:1V) slope to the top of the naturally-deposited soils.
- H. Unclassified Bulk Excavation: Removal of all materials for new construction including soil, boulders, obstructions, regardless of the nature of the material encountered, the water content thereof, and type of equipment required for excavation; and the proper disposal of excavated material not required or suitable for use as specified backfill material.

- I. Rock: Rock (or bedrock) is defined as naturally occurring, intact material which cannot be broken and removed by large power equipment, and requires the use of hoe rams, impact hammers, systematic drilling and blasting, or other mechanical means to fracture and remove. Rock does not include loose, broken, weathered, fractured, or fragmented rock that can be excavated with a large backhoe or excavator. Rock is not anticipated to be encountered on-site.
- J. Boulders: Boulders encountered in any site excavation, of any dimension, and of any hardness or geometry, are considered part of Unclassified Bulk Excavation. The Contractor is responsible for the means and methods of removal and excavation of boulders, and the proper disposal of boulders not suitable for reuse at the site as determined by the Owner or Architect.
- K. AASHTO: American Association of State Highway and Transportation Officials
ASTM: Specifications of the American Society for Testing and Materials
- L. ACI: American Concrete Institute
- M. AWS: Standard Code for Welding in Building Construction, of the American Welding Society
- N. Code: Current Edition of Massachusetts State Building Code
- O. DEP: Massachusetts Department of Environmental Protection
- P. EPA: Environmental Protection Agency
- Q. MassDOT: Massachusetts Department of Transportation
- R. OSHA: Occupational Safety and Health Administration
- S. PCI: Prestressed Concrete Institute

1.05 RELATED WORK SPECIFIED ELSEWHERE

- A. The following related items of work are not included in this Section, but will be performed under the designated Section:
 - 1. Site Preparation
 - 2. Erosion and Sediment Control
 - 3. Storm Drainage System
 - 4. Skinned Infield Mix
 - 5. Athletic Field Construction

1.06 SITE CONDITIONS

- A. The Contractor shall become thoroughly familiar with the site, consult records and drawings of adjacent structures and of existing utilities and their connections, and note all conditions which may influence the work of this Section.
- B. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs

will be allowed because of lack of full knowledge of existing conditions or grades as related to the Drawings.

- C. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval of the Owner.
- D. The Contractor shall be responsible for determining the quantities of earth materials, excavation and backfill, and export of material necessary to complete the Work under this Section. All earth materials, excavation and backfill and export of material shall be included in the Contractor's Base Bid.
- E. Information on the Drawings and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.
- F. Plans, surveys, grade measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no additional compensation will be made for errors and inaccuracies that may be found therein.

1.07 JOB CONDITIONS

- A. Site Information: Data on indicated grades, utilities and other existing conditions are not intended as representations or warranties of accuracy.
- B. Existing Utilities: Locate existing utilities in the work area. If utilities are to remain in place, provide adequate means of protection during installation of site improvements.
- C. Protection: The Contractor shall use all means necessary to protect existing footings, slabs, pavement, utilities, etc., and the materials of this and other sections before, during and after installation. All work shall be executed in such a manner as to prevent any damage to existing utilities, streets, curbs, paving to remain, existing plant materials, and adjoining properties. In the event of damage, make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- D. Clean-up: The Contractor shall remove all debris, construction equipment and scrap material from areas within the limit of work prior to inspection for acceptance.

1.08 QUALITY ASSURANCE

- A. Codes and standards: Perform site improvements work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Qualifications of workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified

requirements and methods needed for proper performance of the work of this Section.

- C. The Owner may at their discretion retain an Engineer or Qualified Testing Agency under the supervision of the Engineer to perform on-site observation and testing during the Work. The presence of the Engineer on-site and the observations and testing performed by the Engineer shall not relieve the Contractor from completing the Work in accordance with the Contract Documents. During final stages of excavation, subgrade preparation, and controlled filling operations, the Contractor shall provide sufficient notice to the Engineer prior to the work and shall cooperate with the Engineer in all respects to facilitate any testing or observations required. The Contractor shall not place a layer of fill until the Engineer has approved the underlying subgrade surface. The Engineer will make such tests, in accordance with the methods specified below, as are deemed necessary to determine compliance with these Specifications. The services of the Engineer may include, but are not limited to, the following:
1. Perform laboratory grain size and compaction testing of backfill materials proposed by the Contractor for on-site use.
 2. Observe and make judgments relating to compliance with project specifications for excavation, dewatering, subgrade preparation, fill placement, and compaction of fill materials.
 3. Perform field unit weight testing to measure in-situ material density, water content and percent compaction of fill materials.
 4. During the course of the Work, the Engineer will inform the Contractor if the Work is not in conformance with the Contract Documents.
 5. The Contractor shall not place or compact any fill, prepare subgrades or place concrete on bearing surfaces unless the Engineer is present. The Contractor shall keep the Engineer informed, at all times, of work activity schedule and allow the Engineer sufficient time to arrive on-site, and perform the necessary observation of activities.
- D. Costs related to testing or replacement of nonconforming Work or materials, and/or delays caused by nonconforming Work or materials, shall be paid for by the Contractor at no additional cost to the Owner.
- E. The presence of the Engineer does not constitute supervision or direction of the Contractor's work. Neither the presence of the Engineer, nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse the Contractor from conformance with these Specifications or from defects discovered in his work or from the Contractor's responsibility for site safety including both persons and property.
- F. Tolerances
1. Construct finished soil and backfill surfaces to plus or minus 1/2-in. of the elevations indicated.

2. Maintain moisture content of fill material as it is being placed within plus or minus two percent of the optimum moisture content of the material as determined by the laboratory tests specified herein.
3. Compaction of backfill shall be at least to the percentage of the material's maximum dry density as indicated in this Section.

1.09 SUBMITTALS

- A. The Contractor shall forward submittals to the Owner's Representative a minimum of three weeks prior to any planned work related to the Contractor's submittals.

1. The time period(s) for submittals are the minimum required by the Owner's Representative to review, comment, and respond to the Contractor. The Owner's Representative may require resubmission(s) for various reasons. The Contractor is responsible for scheduling specified submittals and resubmittals so as to prevent delays in the work.
2. The Contractor's submittals shall be reviewed and accepted by the Owner's Representative prior to conducting any work.
3. Acceptance of the Contractor's submittals by the Owner's Representative does not relieve the Contractor of the responsibility for the adequacy, safety, and performance of the Work.

B. Earthwork Submittals

1. A detailed (1 in. = 10 ft scale) plan and written description showing proposed schedule and sequence of excavation/filling (in plan and cross-section) including site access, truck routes, wheel wash stations and staging areas. Proposed earthwork sequencing and procedures shall include detailed descriptions of all methods, operations and equipment proposed for soil excavation, subgrade preparation, and backfilling.
2. Details of compaction equipment, including descriptions, product literature, specifications and ratings, proposed for use in compacting fill and backfill materials.
3. Manufacturer's literature and technical data for all geotextile and filter fabric material proposed for use on the project site.
4. For each type of off-site material to be utilized as fill or backfill, the Contractor shall deliver to the Engineer's laboratory two (2) 50-lb bag samples from each borrow source or supplier for review and laboratory sieve and compaction testing at least ten (10) business days (i.e. 2 weeks) prior to first use on-site. With each sample provide the following documentation:
 - a. Location and name of material source

- b. Proposed on-site use
 - c. Present and past usage of the source site and material
 - d. All previously existing report(s) associated with an assessment of the source site as relates to the presence of oil or hazardous materials
5. If the subject borrow material does not originate from a commercial borrow source or if directed by the Owner or Owner's Representative (due to the nature of the material), the Contractor shall conduct chemical testing on proposed fill material and submit results prior to delivery to the site, at no additional cost to the Owner. Testing shall be conducted by a certified testing laboratory and shall include the following analytical test data:
- a. Volatile Organic Compounds, (EPA 8260) every 250 cy;
 - b. Semi-Volatile Organic Compounds, (EPA 8270) every 300 cy;
 - c. Pesticides/PCBs (EPA 8080) every 500 cy;
 - d. Total Petroleum Hydrocarbons (EPA 9071/418.1) every 150 cy;
 - e. Thirteen Priority Pollutant Metals (EPA 7000 Series) every 250 cy;
 - f. Total Cyanide (EPA 9010) every 300 cy;
 - g. Total Phenols (EPA 9065) every 300 cy;
 - h. Extractable and Volatile Petroleum Hydrocarbons every 150 cy.
 - i. TCLP for those total parameters which exceed twenty (20) times the TCLP criteria every 250 cubic yards.
- C. Temporary Excavation Support
- 1. Proposed methods to provide temporary lateral earth support. The submittal shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.
- D. Dewatering Submittals
- 1. Drawings and supporting engineering calculations for the proposed surface water control, dewatering systems, sediment control tanks, bag filters, and treatment systems, including their relation to water disposal points.
 - 2. Shop drawings showing proposed types and details of dewatering systems to be used. The submittal shall include the arrangements, locations and depths of the proposed systems, a complete description of equipment and materials to be used and the procedure to be followed in installation, primary power source, operation, maintenance and removal in relation to

the proposed sequence of excavation, foundation construction and backfilling; and the proposed locations of points of discharge of water and their relationship to sediment control facilities.

1.10 LINES, GRADES AND TOLERANCES

- A. The Contractor shall be responsible for establishing all lines, grades, and other survey control to complete the Work. The Contractor shall be responsible for the maintenance and protection of the survey control reference points and location stakes. The Contractor shall employ a Massachusetts-licensed Registered Land Surveyor or Registered Civil Engineer, familiar with building construction, who shall establish lines and levels. The Contractor shall be responsible for the correct location of the proposed facilities, including locations and elevations of fills and utilities.
- B. Finished grades, contours, and elevations indicated on the Drawings describe final surface elevations for completed construction. Spot elevations shall take precedence over contours. The Contractor shall review the Drawing details and Specifications carefully to ascertain specific work limits and requirements for this Contract.

1.11 COORDINATION

- A. All work shall comply with all rules, regulations, laws and ordinances of the State of Massachusetts, Town of Lincoln, OSHA, MSHA, DEP, and all other authorities having jurisdiction.
- B. Prior to start of earthwork operations, the Contractor shall arrange an on-site meeting with the Owner and Engineer for the purpose of establishing the Contractor's schedule of operations and monitoring procedures and requirements.
- C. As construction proceeds, the Contractor shall be responsible for notifying the Engineer at least two working days prior to the start of earthwork operations requiring monitoring and/or testing.
- D. Cooperate with the Engineer in obtaining field samples and conducting field testing. Furnish incidental labor in connection with the required sampling and testing.

1.12 EXCAVATION SUPPORT

- A. The Contractor shall be responsible for design and construction of all necessary excavation support systems and open-cut excavations.
- B. Excavations and the evaluation of the need for earth support shall be performed by a Registered Civil Engineer in the Commonwealth of Massachusetts, retained by the Contractor. The design and construction of all open-cut and retained excavations shall be in accordance with all applicable local, state and OSHA regulations and prudent engineering judgment based on site conditions.

1.13 UTILITY CLEARANCE AND PERMITS

- A. It shall be the responsibility of the Contractor to obtain required permits, licenses, and certificates from all authorities having jurisdiction over this work. Copies of these permits shall be submitted for review prior to the commencement of work.
- B. Do not interrupt, break, or disconnect utilities without first obtaining permission from the utility company and Owner. If interruption is unavoidable, provide a detailed work plan and schedule for temporary services and interruptions for Owner's and the User Agency's approval. Provide temporary services as necessary to serve occupied and used facilities when utilities must be interrupted, or if acceptable to Owner, the utility owner, and adjacent property owners, schedule interruption when the least amount of inconvenience will result.
- C. Provide all protection, including sheeting and shoring, and temporary support, as necessary to prevent damage to existing utilities.
- D. Prior to beginning any excavation or fill placement, accurately locate and mark underground utilities and appurtenances in the Project site area. Excavate to and expose utilities at locations, and conduct field surveys as necessary to determine locations of existing utilities.
- E. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with Owner, and public and private utility companies in keeping respective facilities and services in operation. Repair damaged utilities to the satisfaction of utility company.
- F. In case of any damage or injury caused in the performance of work the Contractor shall, at his own expense make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing utilities damaged during the project work shall be repaired or replaced to their condition prior to commencement of earthwork operations.
- G. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on the Record Drawings and reported in writing to Owner.

1.14 PROTECTION OF PERSONS AND PROPERTY

- A. The Contractor shall be responsible for the health and safety of all workers engaged in the Work.
- B. The Contractor shall protect all existing and newly constructed structures, utilities, streets and other facilities from damages caused by settlement, lateral movement, undermining, physical striking, washout and any other effects created by the Contractor's operations. Sheeting or shoring shall be provided as required to protect adjacent facilities, at no additional cost to Owner. The Contractor shall immediately notify Owner and the User Agency of any damage or impacts caused to any facility, and shall immediately repair or replace such impacted facility in accordance with the direction of Owner.

- C. The Contractor is solely responsible for job site safety, and for the protection of all persons and property within and near the site from adverse impacts of the Work. Immediately repair damaged property to the condition before being damaged.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All soil materials proposed for importing to the site shall be clean, newly-borrowed, mineral soil materials from approved borrow sources, free of any contamination. Materials from construction sites or other non-commercial borrow sources shall not be imported to the site without prior approval of Owner's Representative. All materials being imported to the site shall not contain metals concentrations above Massachusetts rural background concentrations, nor detectable amounts of oil and/or other hazardous materials as defined by the Massachusetts Contingency Plan (CMR 40.0000).
- B. All soil materials to be used as fill will be evaluated, based on information submitted by the Contractor to the Owner's Representative. Materials may be rejected for use based on the results of the evaluation. Materials shall not be brought to site without prior written approval of Owner's Representative. Off-site materials which are rejected for use, if brought to the site, along with any on-site materials impacted by the off-site materials, shall be immediately removed by the Contractor at his own expense, and legally disposed of off-site. Costs and responsibility resulting from any regulatory requirements due to unauthorized hauling of materials to the site shall be borne completely by the Contractor.
- C. Processed materials consisting of a mixture of two or more soil types (such as sand and crushed stone), or crushed concrete, or other crushed construction materials (such as brick or concrete) are not acceptable for use as fill without prior approval of Engineer.
- D. Common Fill (also called "Ordinary Fill"): Common Fill shall consist predominately of mineral, granular soil, free of organic materials, loam, trash, wood, snow, ice, frozen soil, clay, bottles, cans, and other compressible, decomposable or deleterious materials. Common fill from on-site can contain moderate amounts of brick and concrete fragments not exceeding the size limitations indicated below. Common Fill shall have physical properties such that it may be readily spread and compacted without excessive weaving or instability. Common Fill shall not contain particles larger than 8 inch size when compacted with heavy self-propelled vibratory compaction equipment, and not larger than 4 in. size when compacted using hand-operated equipment. Common Fill shall not contain greater than 30% by weight of material passing a No. 200 sieve. On-site excavated fill may be reused as Common Fill provided it is processed to meet the above requirements.
- E. Structural Fill (also called "Granular Fill" and "Pipe Bedding"): Structural Fill from off-site sources shall consist of suitable natural bank-run sand and gravel. Structural Fill shall be free of organic material, clay, debris, loam, trash, wood, snow, ice, and

other compressible, decomposable or deleterious materials or other unsuitable materials and shall be well-graded within the following limits:

Sieve (ASTM D422)	Percent Finer by Weight
3 in.	100
No. 4	30 - 90
No. 40	10 - 50
No. 200	0 - 8

- F. Gravel Borrow: Gravel Borrow shall consist of off-site hard, durable stone and sand, as specified in MassDOT Standard Specifications for Highways and Bridges Designation M1.03.0, Type b, and shall be well-graded within the following limits:

Sieve (ASTM D422)	Percent Finer by Weight
3 in.	100
½ in.	50 - 85
No. 4	40 - 75
No. 50	8 - 28
No. 200	0 - 8

- G. Sand Borrow: Sand Borrow shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam or clay, surface coatings and deleterious materials. The maximum size for Sand Borrow shall be ¼ inch. The allowable amount of material passing a No. 200 sieve shall not exceed 10 percent by weight.

- H. Dense Graded Crushed Stone (Aggregate Base Course): Dense Graded Crushed Stone (Aggregate Base Course) shall consist of off-site angular stone material that is hard, durable and free of deleterious materials. Dense graded crushed stone shall conform to MassDOT Standard Specifications for Highways and Bridges Designation M2.01.7 and the following:

Sieve (ASTM D422)	Percent Finer by Weight
2 in.	100
1-1/2 in.	70 - 100
¾ in.	50 - 85
No. 4	30 - 55
No. 50	8 - 24
No. 200	3 - 10

- I. Double Washed Drainage Stone

¾" – 1½" Crushed Stone for Drainage shall meet the gradation of MDPW Section M2.01.1 requirements for crushed stone, with the additional criteria that no more than 5% by weight shall pass the No. 4 sieve. ¾" – 1½" Crushed Stone for Drainage shall be clean – free of fines, dust, and other deleterious material. The crushed stone will be determined to be clean if, when a sample is placed in a glass jar of water, and the jar is shaken, the water in the jar remains clear and

does not become turbid. The Owner's Representative will be the sole judge of whether the crushed stone is clean.

<u>U.S. Sieve No.</u>	<u>Percent Passing by Weight</u>
2"	100
1½"	95-100
1"	35-70
¾"	0-25
No. 4	0-5

- J. Rip Rap "Modified Rockfill": Rip Rap shall consist of hard, durable angular shaped stones which are the product of the primary crushing of a stone crusher. Rounded stone, boulders, sandstone and similar soft stone or relatively thin slabs will not be acceptable. Stone shall be free from overburden, spoil, shale, organic material. Rip Rap shall conform to MassDOT Standard Specifications for Highways and Bridges Designation M2.02.4 "Modified Rockfill" and meet the following gradation requirements:

<u>Size of Stone</u>	<u>Passing Percentage</u>
8 in.	95-100
4 in.	0 - 25
2 ½ in.	0 - 5

- K. Geotextile: Geotextile shall consist of a non-woven, synthetic, chemically resistant non-biodegradable fabric to act as a filter/soil separator to be laid directly on approved soil subgrades prior to placement of Granular or Drainage Fill as shown in the plans and details. Geotextile shall be equivalent to Mirafi 140N, Mirafi Inc., Pendergrass, GA (888) 795-0808.
- L. Lean Concrete: Lean Concrete shall be commercially manufactured ready-mix concrete having a 28 day compressive strength (f'c) of at least 2,000 psi, unless otherwise noted, and a maximum slump of six to eight inches.
- M. Sedimentation Basin: Water shall be discharged on-site to a Contractor prepared and maintained recharge basin, haybale weirs, or to an Owner identified location in proximity to the Work site. Sedimentation basin to accept collected groundwater/stormwater during site work. Location of the recharge basin should be away from underground structures, the proposed subsurface drainage chambers, and drainage structures to avoid flooding these structures during operation of the recharge basin. At completion of temporary construction dewatering, a layer of geotextile fabric must be placed over the crushed stone layer prior to placing and compacting granular backfill to ground surface.

2.02 EQUIPMENT

- A. Refer to the Athletic Field Specification for Equipment related to Athletic Field Construction.
- B. Compaction equipment shall consist of power-driven mechanical tampers and rollers as approved by the Engineer and in confined areas, hand-guided vibratory equipment.

- C. The Contractor shall provide sufficient earthmoving equipment in good working order to complete the Work in accordance with these specifications and consistent with the construction schedule.

PART 3 - EXECUTION

3.01 GENERAL

- A. The ground adjacent to excavations shall be graded to direct surface water away from excavations. The Contractor shall remove by pumping or other means approved by the Engineer groundwater to a depth of 2 ft below excavation bottoms at all times. Prevent erosion at all times.
- B. Contractor shall provide all bracing, and shoring necessary to perform excavations as required to protect adjacent features, or to conform to governing laws. No extra payment will be made for any bracing, shoring, or underpinning.
- C. Examine the site and all work prepared by others and become familiar with existing site conditions. Report to the Owner in writing any conditions detrimental to the proper and timely completion of the work of this Section. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 USE OF MATERIALS

- A. Existing on-site Topsoil shall be stripped, segregated, and stockpiled for reuse (refer to Athletic Field Specification). Topsoil is not a suitable bearing material for site structures.
- B. Common Fill: It is anticipated that some existing on-site soils may be suitable for re-use as Common Fill. If deemed suitable by the Owner's Representative, the on-site materials shall be placed and compacted in a manner conforming to the applicable Specifications. For use to raise general site grades outside of the building and other structures; in landscaped areas; and as otherwise indicated on the Drawings, provided the material can be readily spread and compacted, without instability. Oversize particles and unsuitable debris shall be removed during or prior to placement. On-site materials which meet the requirements of these Specifications may be used as Common Fill.
- C. Gravel Borrow: Use for sidewalk and pavement base course, utility bedding as shown on the Drawings as well as fill areas noted on the Drawings.
- D. Sand Borrow: Use for pipe bedding only as indicated on the Drawings. Depending on the application, filter fabric may be required in conjunction with Sand Borrow placed within a course backfill zone to prevent particle migration.
- E. Dense Graded Crushed Stone: Use as indicated on the Drawings for parking lots and other applications.

- F. Boulders, if encountered, shall be segregated and stockpiled on site for the potential use as landscaped features, or for optional on-site crushing. The Contractor shall save, segregate, and stockpile such boulders as indicated by the Architect, Owner, or Owner's Representative(s), and dispose of the remaining boulders as part of the Base Bid Price. Unused boulders remain the responsibility of the Contractor, who is responsible for removal and proper disposal away from the job site.
- G. All unsuitable material, and suitable material not required for the proper completion of the Contract, will become the property of the Contractor and shall be removed and properly disposed of away from the job site as part of the Base Bid Price.
- H. If contaminated material is suspected or encountered during an excavation, the Contractor shall contact the Owner or Owner's Representative as soon as possible. Direction on how to proceed and disposition of the excavated material will be provided by the Owner or Owner's Representative.

3.03 EXCAVATION

- A. Perform all excavations in accordance with OSHA requirements. The Contractor shall be solely responsible for maintaining site safety, in accordance with OSHA, the Contractor's Health and Safety Plan and other applicable regulations.
- B. Excavation shall include the removal of all materials encountered including earth, boulders, rock, pavement, demolition debris, incidental structures, utilities, and other materials as required to complete the Work specified in this Section and as shown on the Drawings.
- C. The Contractor shall handle, segregate to prevent intermixing of materials, protect, and stockpile as required to complete the Work specified in this Section and as shown on the Drawings.
- D. Do not remove material from the site, without permission of the Owner and/or Owner's Representative.
- E. Where soil has been softened, frozen or otherwise disturbed, due to the presence of water or as a result of unfavorable weather, remove the unstable, disturbed material and replace with suitable material as directed by the Engineer, at no additional cost to the Owner.
- F. Where excavation is carried out below indicated grade or beyond the lines of excavation, backfill to the indicated grade and compact with acceptable materials, at no additional cost to the Owner and at the direction of the Engineer.
- G. When excavation has reached required subgrade elevations, notify the Engineer who will observe the excavation and bearing conditions. Excavations required to proceed deeper due to disturbance of the subgrade, or variation in subsurface conditions shall be completed at no cost to the Owner.

- H. Excavate trenches to the depth indicated or required. Carry the depth of trenches sufficiently deep to install required bedding materials and to establish the indicated flow lines and invert elevations. Maintain all trench excavations in a safe manner and in accordance with applicable laws and regulations. Dimensions of trench excavations shall be maintained as small as practical to safely conduct the work.

3.04 UNAUTHORIZED EXCAVATIONS

- A. Unauthorized excavation consists of removal of materials beyond required design subgrade elevations or dimensions without specific direction from the Engineer. Unauthorized excavation, as well as remedial work directed by the Owner, shall be at the Contractor's expense.
- B. Backfill and compact unauthorized excavations with Granular Fill, crushed stone encapsulated in filter fabric or other materials specified by the Engineer.

3.05 SUBGRADE PREPARATION

- A. General:
 - 1. Complete the excavations to the required subgrade elevations.
 - 2. All final excavated subgrades shall be proof-rolled prior to placing any fill materials or continuing with construction. Proof-rolling in open areas shall consist of a minimum of 6 passes of a suitable sized static, self-propelled roller. Proof-rolling in confined areas such as within trenches shall consist of a minimum of 4 passes of a large vibratory-plate compactor imparting a centrifugal (dynamic) force of 11,000 lbs.
 - 3. Soft or weaving soils or other materials observed during proof-rolling shall be overexcavated and replaced with compacted lifts of common fill or other materials as directed by the Engineer.
 - 4. Protect all subgrades after final preparation and during filling or other construction. Disturbance to approved subgrades shall be rectified by the Contractor prior to continuing with the work as directed by the Engineer.
- B. Cold Weather Subgrade Protection:
 - 1. When the atmospheric temperature is less than 32 degrees Fahrenheit (°F), the Contractor shall protect excavation subgrades and concrete from freezing. Cold weather subgrade protection may consist of an earth fill cover, hay cover, insulation cover, heating or other means of protecting the subgrade materials from freezing.
- C. Wet Weather:
 - 1. If fill material placement, spreading, rolling, or compaction operations are interrupted by rain or other unfavorable conditions, do not resume such

operations until ascertaining that the moisture content and density of the previously-placed soil are as required by these specifications.

3.06 SHORING, SHEETING, AND BRACING

- A. Provide shoring, sheeting, and bracing at excavations, as required, to assure complete safety against collapse of earth at sides of excavations or earthen slopes.
- B. If, at any place, sufficient or proper supports have not been provided, additional supports shall be placed at the expense of the Contractor. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- C. All sheeting and bracing not ordered left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities or property whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand and rammed with tools especially adapted to that purpose or otherwise compacted as directed to achieve the required density.
- D. The portion of sheeting driven below mid-diameter of any pipe shall not be withdrawn and under no circumstances shall any sheeting be cut off at a level lower than one foot above the top of pipe.
- E. Shoring or sheeting shall not constitute a condition for which an increase may be made in the contract price with the exception that if the Owner's Representative directs in writing that certain shoring or sheeting shall be left in place, the contract price will be adjusted in accordance with General Conditions.
- F. Excavation support systems shall be designed to support the earth pressures, hydrostatic pressures, surcharge loads and other forces from existing site conditions, stored material and construction equipment.
- G. Shoring and bracing of trenches and other excavations shall, at a minimum, be in accordance with the latest requirements of the Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926).

3.07 PLACEMENT OF BACKFILL MATERIALS

- A. General:
 - 1. Backfilling activities, including placement and compaction, shall not be performed when air temperatures are at or below 32°F.
 - 2. Backfill excavations as promptly as work permits, but not until the subgrade, or below grade construction, is acceptable to The Engineer.
 - 3. Previously placed, and possibly accepted, backfill shall be excavated and replaced at no additional cost if the backfill does not conform to the Contract Documents or is damaged or disturbed by construction activity.

B. Backfill Materials:

1. All backfill materials brought to the site must be obtained from a borrow source(s) approved by the Engineer.
2. Backfill placed outside the limits of the structure in landscaped areas shall consist of compacted common fill or other materials as indicated on the Drawings.

C. Placement, Compaction and Protection:

1. All backfill material shall be placed "in-the-dry" on subgrades acceptable to the Engineer. The Contractor shall dewater excavated areas as required to perform the work in such a manner as to preserve the undisturbed state of the approved subgrade material.
2. Backfill materials shall not be placed on snow, ice, frozen subgrades or uncompacted frozen soil.
3. Backfill materials shall not be frozen when placed or be allowed to freeze prior to or after compaction, placement, or curing. At the end of each day's work during freezing weather, the last lift of fill, after compaction, shall be rolled by a smooth-wheeled roller to eliminate ridges of uncompacted soil.
4. Unless otherwise specified herein, place fill materials in layers not exceeding 12 in. in thickness measured prior to compaction in open areas, and 6 in. in thickness in confined areas, such as in trenches. Compact each layer with a minimum of six coverages of the equipment described below to obtain at least 95 percent of maximum dry unit weight as determined by ASTM Test D1557.
5. Maintain the moisture content of the fill material during placement within plus or minus two percent of the material's optimum moisture content per ASTM D1557, and as required to achieve the specified compaction.
6. Within 3 ft below paved areas (i.e., roadways, sidewalks, parking areas, etc.), place required fill materials in layers not exceeding 9 in. in depth measured prior to compaction and compact each layer by suitable compaction equipment to at least 95 percent of the material's maximum dry unit weight as determined by ASTM Test D1557.
7. Under landscaped areas, place required fill materials in layers not exceeding 12 in. in thickness prior to compaction and compact by suitable compaction equipment to achieve at least 92 percent of the material's maximum dry unit weight, as determined by ASTM Test D1557 or as required by the Architect.
8. The Contractor shall not begin backfilling against concrete until the concrete has sufficiently aged to attain the strength required to resist

backfill pressures without damage. The Contractor shall correct any damage to the structures caused by backfilling at no added cost to Owner.

9. Moisture Control: Where exposed subgrades or fill materials must be moisture conditioned before compaction, uniformly apply water to surface soil material, to prevent free water from appearing on surface during or subsequent to compaction operations.
 - a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - b. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing, until moisture content is reduced to a satisfactory value.
10. If weaving or instability is observed during compaction, as judged by the Engineer, compaction efforts shall be discontinued until the Contractor stabilizes the subgrade. If required, the Contractor shall excavate and replace the unstable fill material with acceptable compacted material, at no additional cost to Owner.
11. Compaction by puddling or jetting is prohibited.
12. Control groundwater and surface run-off to minimize disturbance of material being placed. Slope fill surfaces at the end of each day to provide for free surface drainage. Dewater all subgrades prior to filling. Place all fill in-the-dry.
13. Provide suitable transition layers or non-woven filter fabric, as required to prevent the migration of fine material into void spaces of coarser fill materials. Transition layers may consist of limited thickness of dense-graded crushed stone (less than 6 inches thick), lean concrete or other methods approved by the Engineer. Clean crushed stone shall not be placed directly on soil subgrades beneath structures.

D. Trench Backfill

1. Trenches shall be backfilled as soon as practicable.
2. Utility bedding material shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench as shown on the Drawings. The backfill material shall be placed by hand shovels, in layers not more than 4 inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids.
3. Trench backfill material above the utility bedding material shown on the Drawings and may consist of the excavated soils, provided the excavated soils meet the specific requirements for fill for the intended area (e.g., below slabs, foundations, parking areas , etc.), and can be readily spread

and compacted. Landfill debris materials shall not be used as backfill within any utility trenches. Peat and other organic soils shall not be used as trench backfill. Particles larger than two (2) inches shall not be placed within eight (8) inches of any utility pipe. The maximum particle size within any trench backfill material shall be 6 in.

4. All trench backfilling shall be done so as not to disturb the work at any time. The moisture content of the backfill material shall be such that proper compaction will be obtained. Puddling of backfill with water will not be permitted.
5. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to Owner.
6. During filling and backfilling operations, pipelines may be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the inspection of the pipeline shows poor alignment, displaced pipe or any other defects, the work shall be remedied in a manner satisfactory to the Engineer at no additional cost to Owner.

3.08 COMPACTION REQUIREMENTS

- A. Relative compaction is expressed as a percentage of the maximum dry density at the optimum moisture content as determined by ASTM Test D1557, Method C. Compact fill materials in successive lifts in accordance with the following requirements:

<u>Content</u>	<u>Area</u>	<u>Compaction Requirements</u>	<u>Moisture</u>
Under Paved Areas and sidewalks		92% up to 3 ft below finished grade 95% within 3 ft of finished grade	--
Trench backfill		93%	--
Wall backfill and slopes		93%	--
Landscape and lawn areas (as required by Owner's Representative)		Refer to Athletic Field Spec	--

Note: Fill placed within landscape islands, in areas abutting pavements, and within 5 ft of pavements shall be compacted according to the compaction requirements for fill below pavements.

- B. The gradation and nature of some on-site materials are such that field unit weight testing methods (sand cone and nuclear density equipment) may not provide representative compaction results. In these cases, the Engineer will use judgment in evaluating if the Contractor achieved the intent of the specification.

3.09 MOISTURE CONTROL AND REUSE OF ON-SITE MATERIALS

- A. Fill that is too wet for proper compaction shall be harrowed, or otherwise dried or treated to achieve a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier material, at no additional cost to the Owner.
- B. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.
- C. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

3.10 PROTECTION OF FILLS AND SUBGRADES

- A. Protect all compacted fills from disturbance and traffic. Repair any subgrades that become disturbed or unstable.
- B. Upon completion of the Work, ground surface shall be left in a firm, stable, unyielding, uniform condition, free of ruts and surface irregularities, in accordance with the grading requirements shown on the Drawings.
- C. Uniformly smooth-grade all areas to be graded, as indicated and as directed, including excavated sections and all areas disturbed as a result of the Contractor's operations.

3.11 DEWATERING

- A. The Contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties.
- B. The Contractor shall excavate interceptor swales and ditches as necessary prior to the start of major earthmoving operations to insure minimal erosion and to keep areas as free from surface water as possible.
- C. Should surface, groundwater or precipitation be encountered during the operations, the Contractor shall furnish and operate pumps or other equipment, and provide all necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to work or adjacent properties for such water. All piping exposed above surface for this use, shall be properly covered to allow foot traffic and vehicles to pass without obstruction.
- D. Presence of groundwater in soil will not constitute a condition for which an increase in the contract price may be made. Under no circumstances place concrete fill, soil fill, lay piping or install appurtenances in excavation containing free water. Keep utility trenches free of water until pipe joint material has hardened and backfilled to prevent flotation.

- E. The Contractor shall verify that the construction and/or operation of a dewatering system will not adversely affect any well, pond, stream, structure, utility, etc., on or adjacent to the area being dewatered.

3.12 EROSION AND SEDIMENTATION CONTROL

- A. Contractor shall be responsible for all control measures necessary to prevent damage resulting from erosion and sedimentation to on-site and off-site areas.
- B. Temporary hay bales or other provisions such as de-silting basins, terraces, contour furrows, channel linings, waterways or other measures shall be installed in a manner satisfactory to the Architect and maintained in good operating conditions.
- C. Contractors shall provide adequate protection and complete the grading as specified without delay on the areas that may be potential contributors to pollution or natural waterways or cause damage because of sedimentation.

3.13 DUST CONTROL

- A. The Contractor shall employ methods and/or materials to prevent spread or dust. Chemical materials may not be used on subgrades of area to be sodded or planted.

END OF SECTION

SECTION 31 10 00
SITE PREPARATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Installation of construction fencing.
 - 2. Clearing, grubbing, and disposing of vegetation, including bushes, brush, trees, stumps, roots, rubbish, refuse, trash and debris as shown within the indicated limits.
 - 3. Protection from injury to or defacement of trees and other vegetation and objects indicated on the plans or designated by the Owner's Representative to be preserved.
 - 4. Protection of utilities.
 - 5. Stripping and stockpiling of the existing topsoil to depths as shown on the plans.
 - 6. Removal, salvage, or other disposition of slabs and footings, existing pavement, curbs, sidewalks, walls, steps, structures, signage and posts, fencing, stone walls and all other site improvements which interfere with construction as indicated, or as required, by the Owner's Representative.
 - 7. Coordination of disconnection and capping of utilities and/or removal or relocation of utilities and utility poles, as needed.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Erosion and Sedimentation Control
- B. Earthwork
- C. Storm Drainage
- D. Athletic Field Construction
- E. Irrigation

1.04 JOB CONDITIONS

- A. General: The Contractor shall visit and accept the site as he finds it, and shall inform himself of the character and the type of site items to be removed. The Contractor shall walk the site with the Owner's Representative prior to commencing work to review the full scope of demolition and items to remain. The Owner assumes no responsibility for the actual condition or structural adequacy of any existing construction to be demolished.
- B. Damage or loss to site improvements shall be at the risk of the Contractor from and after the date of Contract execution, and no such damage or loss shall relieve the Contractor from any obligation under the Contract.
- C. Disposal: Dispose of cleared, grubbed, and removed material off the site. Burning of materials on the job site will not be permitted.
- D. Traffic: Conduct operations and removal of debris to ensure minimum interference with the normal use of corridors, public ways and other adjacent facilities. Do not close or obstruct traffic ways, corridors, streets, walks or other used facilities without the written permission of the Owner and authorities having jurisdiction.
- E. Protection: Prevent injury to persons and damage to property. Immediately repair damaged property to its condition before being damaged.
- F. Shoring and Bracing: Provide adequate shoring and bracing to prevent uncontrolled collapse or damage to existing structures or utilities.
- G. Dust and Noise Control: Take effective measures to prevent windblown dust and to control noise to avoid creating a nuisance. Avoid creating ice hazards in freezing weather.
- H. Utilities: Maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage. Do not interrupt utilities serving used areas without first obtaining permission from the utility company and the Owner's Representative. Provide temporary services as required.

PART 2 - PRODUCTS

2.01 CONSTRUCTION FENCING

- A. The Contractor may use the existing site fencing to the extent practicable as construction fence. However, if additional fencing is required to maintain a secure site, the fencing shall be equivalent to the following:
 - 1. Provide 6' temporary portable chain link fence at the Limit of Work Line as shown on plans. Contractor shall use the fencing to provide a secure site and fence shall be equivalent to Temporary Fence Panels as provided by National Rent-A-Fence. Fence panels shall be connected as needed to provide proper security.

2.02 STOCKPILE COVER

- A. Reinforced polypropylene tarps, resistant to ultraviolet radiation.
- B. Secured with ropes and anchors, as required and approved by the Owner's Representative.
- C. Stockpiles shall be surrounded with siltation barriers, refer to plans and Erosion Control Specification for details.

PART 3 - EXECUTION

3.01 DEMOLITION

- A. General: Demolish completely and legally remove from site and dispose of properly all items indicated on the drawings. Proceed with demolition systematically.
- B. Demolish all existing above and below grade improvements except those indicated to remain. Wherever areas of new construction are shown to go over or encompass existing constructions or improvements, the existing construction and improvements shall be completely removed in their entirety, unless specifically indicated to remain.
- C. All demolition disposals must comply with all State and Federal regulations for waste stream management, recycling and any other provisions of the law.

3.02 CLEARING AND GRUBBING

- A. Clear materials specified herein to the limits shown and remove from the site.
- B. Remove stumps and roots completely in all proposed paved or built areas and to 18" minimum below grade where lawn is to be installed; 3'-0" minimum in areas designated for shrubs, 4'-0" minimum for trees.

3.03 SALVAGE

- A. Salvage indicated material or materials determined to be suitable and required for reuse, including: grates, frames or other metal castings and miscellaneous parts of inlets and manholes; hydrants in functional condition; light poles; wood and metal fences; signs; curbing; stone from stone walls and other miscellaneous site items as indicated on the Drawings. Stockpile items to be salvaged in on-site or off-site location, as designated by the Owner's Representative.
- B. Protect (metallic) coatings on salvaged items. Remove adhering concrete from salvaged items.
- C. Reassembly Documentation:

1. Provide documentation suitable for future use in the re-assemble of salvaged items. Documentation shall be in the form of a drawing or set of drawings for each assembly. Clearly identify each component of each assembly on the related drawing with identifying marks matching the labels or marks on the components as stored or stockpiled. Provide additional notes on the Drawings to aid in re-assembling. Include unusual operations, sequence of assembly, and damaged or missing components.

D. Items to be Packaged and Stored Off-Site:

1. Items to be packaged and stored off-site shall be carefully packaged in a substantial manner with all related components, accessories, and fasteners, clearly tagged for reassembly. Photocopies of reassembly documents shall be included in each package of each group of related components.
2. Type or label components with identifying code to provide proper reassembly.
3. Packaging shall be suitable for material, and shall be secure.
4. Dry components thoroughly; coat components susceptible to corrosion and all threaded areas with anti-corrosion coating.

3.04 STRIPPING AND STOCKPILING TOPSOIL

- A. Refer to the Athletic Field Construction specification for information on topsoil stripping procedures.
- B. Stockpile areas for topsoil shall be as indicated on Drawings, or as directed by the Owner's Representative. Should the topsoil be stockpiled in any area without prior approval of the Owner's Representative, the Owner's Representative may direct the Contractor to relocate such stockpile to another portion of the site, and the Contractor shall do so at no additional cost to the Owner.
- C. The Contractor shall be responsible for loading and removal of the stockpiled topsoil. The Contractor shall coordinate timing of the removal with the Owner.
- D. Do no soil stripping without clear understanding of existing soil, planting and site conditions to be preserved.
- E. Immediately after stockpiling and at the end of each working day cover the stockpile completely with a polypropylene tarp. Secure tarp.

3.05 BACKFILL

- A. Backfill trenches and excavations resulting from work under this Section in accordance with Section 31 00 00, EARTHWORK.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions, including but not limited to silt fence, hay bales, temporary seed cover and erosion control jute netting, detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Site Preparation
- B. Storm Drainage System
- C. Athletic Field Construction

1.04 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
- B. Commonwealth of Massachusetts Department of Transportation "Standard Specifications for Highways and Bridges" (MassDOT Specifications).

1.05 SUBMITTALS

- A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion and siltation control including 1" = 30' scale plans (or other appropriate scale as approved by the Owner's Representative) indicating location of erosion control devices and siltation basins.
2. List of proposed materials including manufacturer's product data.
3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.

B. The following samples shall be submitted:

1. Filter fabric 12 x 12 in. Sample
2. Erosion control netting 12 x 12 in. Sample

1.06 EROSION CONTROL PRINCIPLES

A. The following erosion control principles shall apply to the land grading and construction phases:

1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
2. Whenever feasible, natural vegetation shall be retained and protected.
3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.
4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.
5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
6. Sediment shall be retained on-site.
7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.

B. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to six months, and temporary erosion protection when erosion exposure period is expected to be less than six months.

1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
2. Temporary erosion protection shall be accomplished by covering with an erosion protection material appropriate for prevailing conditions.
3. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 3:1 (horizontal: vertical) cut slopes shall be limited to a grade of 2:1.

PART 2 - PRODUCTS

2.01 SILTATION BARRIER

- A. Siltation Barrier shall be a wire-bound woodroll snow fence covered with filter fabric. Fence shall be 4 ft. high minimum, and shall have 3/8 in. by 1- 1/2 in. wide pickets, approximately 2 in. apart, bound together with at least 13 gage minimum, galvanized steel wire.

1. Filter fabric shall be one of the following, or approved equal:

Product	Manufacturer
Trevira Spunbond	Hoechst Fibers Industries
Fabric Type 1120	Spartanburg, SC 29304
Supac N 5NP(UV)	Phillips Fibers Corporation, Greenville, SC 29602

2. Siltation Barrier shall be supported by steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.
3. Barrier other than that specified above shall be subject to review and acceptance by the Owner's Representative.

2.02 COMPOST SOCK

- A. Compost Sock for construction of erosion control devices shall be new, firm, fully biodegradable, non-polypropylene.
- B. Compost Sock shall be equivalent to Filtrex.

2.03 FILTER FABRIC SILT SACK

- A. Filter fabric silt sack for inlet protection shall be woven polypropylene geotextile sewn using a high strength nylon thread sized to fit opening of the inlet structure.
- B. Filter Fabric Silt Sack shall be equivalent to Siltsack® as manufactured by ACF Environmental, Inc.

2.04 TEMPORARY SEED COVER

- A. Seed mixture for temporary cover by hydroseeding application shall conform to the following:

<u>Material</u>	<u>Quan./1000 sf. coverage</u>
Wood Fiber Mulch	27-1/2 lb.
Seed	4 lb.
Annual Ryegrass	1/2 lb.
10-6-4 Fertilizer	22 lb.

Water 69 gal.

1. Wood fiber mulch shall conform to MHD Specifications Section M6.04.4, "Wood Fiber Mulch".
 2. Seed shall conform to MHD Specifications Section M6.03.0, "Seed for Slopes and Shoulders".
- B. Hydroseeding equipment may be either portable or truck mounted, with dual agitation, a minimum working volume of 1000 gallons and a minimum spray range of 80 ft.
- C. Hydroseeding equipment must be capable of uniformly applying the slurry mix including wood fiber mulch if required, at the specified rate, and at the required locations.
- D. Hydromulching equipment, either trailer or truck mounted, must be capable of uniformly applying straw or hay mulch at a minimum mulching rate of 8 tons per hour, at a distance of not less than 80 ft.

2.05 MISCELLANEOUS ITEMS

- A. Aggregate for construction entrances shall conform to MHD Specifications Section M2.01.1.
- B. Crushed stone shall be durable, crushed stone or gravel from off-site sources, conforming to the following:

<u>Location or Use</u>	<u>MHD Spec. Section</u>
Stabilized Construction Entrance	M2.01.1

2.06 EROSION CONTROL NETTING (JUTE MESH)

- A. Erosion control netting shall be manufactured of jute fibers with 1" x 1" mesh and be delivered to the site in 4' x 225' rolls. The jute erosion control material shall be fully biodegradable within 2-3 years pending soil and weather conditions. Roll weight shall be approximately 70 lbs. Shall be equivalent to the erosion control netting manufactured and/or provided by the following companies:
1. Indian Valley Industries, Inc.
Johnson City, NY
(800) 659-5111
 2. ACF Environmental
Richmond, VA
(800) 448-3636
 3. Emerald Seed and Supply
Portland, OR
(800) 826-8873

PART 3 - EXECUTION

3.01 SILTATION BARRIER

- A. Siltation Barrier shall be constructed and installed as indicated on the Drawings prior to the start of clearing and grubbing operations.

3.02 HAY BALE CATCH BASIN FILTER

- A. Catch basin filters shall be placed at all inlets to drainage structures as structures are installed. Outlet protection work shall be constructed before runoff is allowed to enter the drainage system. Construction and location of catch basin filters shall be as indicated on the Drawings.

3.03 COMPOST SOCK

- A. Compost Sock shall be constructed as required. Compost Socks shall be placed in a row with ends tightly abutting the adjacent socks. Each sock shall be embedded in the soil a minimum of 4 in. Socks shall be securely anchored in place by stakes driven through the socks. The first stake in each sock shall be angled toward the previously laid sock to force the socks together.

3.04 FILTER FABRIC SILT SACK

- A. Filter Fabric Silt Sack shall be installed at all inlets to the drainage infrastructure as indicated on the plans and as required to avoid sediment entry into drainage system. Silt Sacks to be installed and maintained according to manufacturer's instructions.

3.05 HYDROSEEDING

- A. Seed for temporary cover shall be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, fertilizer, mulch and water shall be mixed and applied to achieve application quantities specified. Material shall be applied in 2 equal applications, with the equipment during the second pass moving perpendicular to direction employed during the first pass. Hydroseeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.
- B. If the results of hydroseeding application are unsatisfactory, the mixture and/or application rate and methods shall be modified to achieve the required results.
- C. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass.

3.06 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

- A. Wetland areas, water courses, and drainage swales adjacent to construction activities shall be monitored twice each month for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.
- B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.
- C. Erosion Control Devices
 - 1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
 - 2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
 - 3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.
 - 4. Sediment shall be removed from the retention ponds at the completion of the Project and periodically during construction. Sediment deposits shall be removed when sediment has accumulated to a depth of 12 in. or as directed.
 - 5. Sediment deposits shall be disposed of off- site, in a location and manner which will not cause sediment nuisance elsewhere.
- D. Removal of Erosion Control Devices
 - 1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
 - 2. Erosion control netting shall be kept securely anchored until start of permanent turf construction.
 - 3. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

3.07 EROSION CONTROL NETTING (JUTE MESH)

- A. Provided and install in accordance with manufacturer's recommendations and in areas detailed on the Drawings.

END OF SECTION

SECTION 31 25 01
STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section specifies requirements for implementation of the Storm Water Pollution Prevention Plan (SWPPP) which shall be periodically updated during construction by the Contractor.
- B. The storm water pollution prevention measures contained in the SWPPP are the minimum required. The Contractor shall provide additional measures to prevent pollution from storm water discharges in compliance with the NPDES and all other local, state and federal requirements.
- C. For construction areas greater than 1-acre in size, the Contractor serving as project Operator shall NOT begin construction without submitting evidence that a "National Pollution Discharge Elimination System" (NPDES) Notice of Intent governing the discharge of storm water from the construction site for the entire construction period has been filed at least 3 weeks prior to construction. It is the Contractor's responsibility to complete and file the NPDES Notice of Intent. If filing electronically on the EPA website, and Operator is authorized to discharge stormwater from construction activities under the terms and conditions of the CGP permit fourteen (14) calendar days after acknowledgment of receipt of your complete NOI is posted on EPA's NPDES website <http://www.epa.gov/npdes/stormwater/cgp>. The Operators must include a copy of the EPA active status notification in the SWPPP as soon as it becomes available.
- D. The Contractor shall conduct the storm water management practices in accordance with local regulations and governing authorities, the Federal NPDES permit requirements and for any enforcement action taken or imposed by Federal or State agencies. The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.
- E. As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor shall execute a Certification and Notification form, a copy of which is included in SWPPP to be provided to the contractor.
- F. A site is considered finally stabilized when soil disturbing activities have been completed and either a uniform perennial vegetative cover with a density of at least 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent stabilization measures have been employed. The Owner or Operator(s) must complete and file a Notice of Termination (NOT) with the EPA. The form can be downloaded at EPA's website at http://www.epa.gov/npdes/pubs/cgp2008_appendixf.pdf

1.02 RELATED SECTIONS

A. Sections which directly relate to the work of this Section include:

1. Site Preparation
2. Earthwork
3. Erosion Control

1.03 REFERENCES

- A. Guidance Manual—"Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices" (EPA 832-R-005).
- B. Summary of Guidance Manual—"Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices" (EPA).
- C. Massachusetts Stormwater Management Policy Handbook (Volume I) and Technical Handbook (Volume II) issued by the Massachusetts Department of Environmental Protection, March 2008.
- D. Massachusetts Sediment and Erosion Control Guideline for Urban and Suburban Areas, March, 1997.

1.04 SUBMITTALS

- A. Contractor's Certification for Contractor and each Subcontractor copy of which is included within the SWPPP to be provided to Contractor.
- B. Copies of Contractor's inspection reports.
- C. Names, addresses, and telephone numbers of Contractors and Subcontractors responsible personnel who can be contacted under emergency conditions.
- D. A construction schedule which indicates specific activities related to the SWPPP.
- E. A Supplemental Plan indicating location of laydown and staging areas, etc., and their incorporation into the SWPPP.

1.05 INSPECTIONS

- A. The Contractor shall inspect disturbed areas of the site at least once per week and within 24 hours of a storm of 0.25 inches or greater. Such inspections may be performed in conjunction with the provisions for the maintenance of Erosion Control Measures in Section 31 25 00.
- B. A maintenance inspection report shall be prepared after each inspection. The Contractor shall identify one individual who will be responsible for conducting inspections and preparing the reports. The Contractor shall also designate a person who will fill in for the inspector during absences. These individuals shall be

trained in all maintenance and inspection practices necessary for keeping the sediment and erosion control measures in proper working order.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 EROSION CONTROL DEVICES

- A. Erosion Control Devices shall be constructed as shown on the site plans and SWPPP and as specified in Section 31 25 00.

3.02 STORM WATER POLLUTION PREVENTION PRINCIPLES (SWPPP)

The following general principles shall be followed by the Contractor during the construction phase:

- A. Protect and maintain existing vegetation wherever possible.
- B. Minimize the area of disturbance.
- C. To the extent possible, route unpolluted flows around disturbed areas.
- D. Install mitigation devices as early as possible.
- E. Minimize the time disturbed areas are left unstabilized.
- F. Maintain siltation control devices in proper condition.

3.03 STORM WATER POLLUTION PREVENTION PLAN

- A. The Contract drawings and specifications identify a portion of the required facilities and temporary erosion and sedimentation control devices. The Contractor shall update the project SWPPP in accordance with NPDES requirements which identifies the location of construction facilities and proposes additional erosion and sedimentation control measures as required to minimize pollution. The SWPPP shall include provisions for but not be limited to the following:
 - 1. Construction Trailers
 - 2. Laydown Areas
 - 3. Equipment Storage Areas
 - 4. Stockpile Areas

- B. Reproducible copies of one or more of the Contract Drawings and original SWPPP will be provided to the Contractor to serve as a base for the Contractor's SWPPP updates.

END OF SECTION

SECTION 32 12 17
POROUS ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of this Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Subgrade Preparation.
 - 2. Installation of underlying porous media beds.
 - 3. Rough grading and compaction of base material.
 - 4. Porous Asphalt Pavment

1.03 REFERENCES

- A. Work shall conform to codes and standards of the following:
 - 1. ASTM - American Society for Testing and Materials
 - 2. Mass. Specs. - Massachusetts Highway Department Standard Specifications for Highways and Bridges.
 - 3. AASHTO - American Association of State Highway and Transportation Officials.
 - 4. Americans with Disabilities Act (ADA).
 - 5. Massachusetts Architectural Access Board (MAAB).
 - 6. NAPA - National Asphalt Pavement Association

1.04 QUALITY ASSURANCE

- A. Codes and standards: Perform site improvement work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Qualifications of workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- C. Layout and Grading: After staking and laying out the work, and before beginning final construction, obtain the Landscape Architect's approval of layout and grades. Contractor shall make minor adjustments as determined by the Landscape Architect.
- D. The Contractor and his Subcontractors shall inspect all subbases for unstable,

unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be held responsible for any corrections required to properly implement the Construction Documents.

- E. Quality Assurance requirements for production of mix are discussed in the Materials section, and for construction of the porous media beds and paving in the Execution section.
- F. Weather Limitations
 - 1. Pavement shall not be placed between November 15 and March 15, or when the ambient air temperature at the pavement site in the shade away from artificial heat is below 16 °C (60 °F) or when the actual ground temperature is below 10 °C (50 °F). Only the Engineer may adjust the air temperature requirement or extend the dates of the pavement season.
 - 2. The Contractor shall not pave on days when rain is forecast for the day, unless a change in the weather results in favorable conditions as determined by the Engineer.
- G. QC/QA During Production
 - 1. The Contractor shall provide at his expense and the Engineer's approval a third-party QA Inspector to oversee and document mix production. All mix testing results during production should be submitted to the QA Inspector.
 - 2. The QC plan may be altered at the discretion of the Engineer and based on feasible testing as suggested by the asphalt producer. Certain QC testing requirements during production may not be feasible for small projects in which limited asphalt is generated. Some testing methods cannot be completed during the time needed during small batch production. The feasibility should be assessed with the Engineer and producer.
 - 3. The mixing plant shall employ a Quality Control Technician (QCT). The QCT will perform QC/QA testing and will be certified in the discipline of HMA Plant Technician by the relevant certifying agency (e.g. NETTCP in New England). The Contractor shall sample, test and evaluate the mix in accordance with the methods and minimum frequencies in **Table 1** and the Post-Blended SBR Binder Quality Control Plan (if applicable).

Table 1. QC/QA testing requirements during production.

<u>Test</u>	<u>Min. Frequency</u>	<u>Test Method</u>
Temperature in Truck at Plant	6 times per day	
Gradation	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	AASHTO T30
Binder Content	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	AASHTO T164

Air Void Content	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	ASTM D6752
Binder Draindown	greater of either (a) 1 per 500 tons, (b) 1 per day, or (c) 1 per job	ASTM D6390

4. If an analyzed sample is outside the testing tolerances immediate corrective action will be taken. After the corrective action has been taken the resulting mix will be sampled and tested. If the re-sampled mix test values are outside the tolerances the Engineer will be immediately informed. The Engineer may determine that it is in the best interest of project that production is ceased. The Contractor will be responsible for all mix produced for the project.
5. Testing Tolerances During Production. Testing of the air void content, binder draindown, and TSR shall be within the limits set in herein. The paving mixture produced should not vary from the design criteria for aggregate gradation and binder content by more than the tolerances in **Table 2**.

Table 2. QC/QA testing tolerances during production.

Sieve Size (inch/mm)	Percent Passing
0.75/19	-
0.50/12.5	±6.0
0.375/9.5	±6.0
No.4/4.75	±5.0
No.8/2.36	±4.0
No.200/0.075 (#200)	±2.0
%PGAB	+0.4, -0.2

6. Should the paving mixture produced vary from the designated grading and asphalt content by more than the above tolerances, proper changes are to be made until it is within these tolerances.
7. Samples of the mixture when tested in accordance with AASHTO T164 and T30 shall not vary from the grading proportions of the aggregate and binder content designated by the Engineer by more than the respective tolerances specified above and shall be within the limits specified for the design gradation.
8. Plant Shutdown and Rejection of Mix. Should the mix not meet the tolerances specified above upon repeat testing, the Engineer may reject further loads of mix. Mix that is loaded into trucks during the time that the plant is changing operations to comply with a failed test shall not be accepted, and should be recycled at the plant.

H. QC/QA requirements for Porous Media Bed Construction.

1. QC/QA activities are summarized below:

<u>Activity</u>	<u>Schedule</u>
Contractor to notify Engineer for approval	24 hours in advance of start of work
Contractor to notify Engineer for Approval	After subgrade preparation, before construction of porous media bed
Contractor to notify Engineer for Approval	After choker course placed, before placement of pavement

I. QC/QA for Paving Operations

1. The full permeability of the pavement surface shall be tested by application of clean water at the rate of at least 5 gpm over the surface, using a hose or other distribution devise. Water used for the test shall be clean, free of suspended solids and deleterious liquids and will be provided at no extra cost to the Owner. All applied water shall infiltrate directly without large puddle formation or surface runoff, and shall be observed by the Engineer.
2. Testing and Inspection: Employ at Contractor's expense an inspection firm acceptable to the Engineer to perform soil inspection services, staking and layout control, and testing and inspection of site grading and pavement work. Inspection and list of tests shall be reviewed and approved in writing by the Engineer prior to starting construction. All test reports must be signed by a licensed Engineer.
3. Test in-place base and surface course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable work as directed by the Engineer.
4. Surface Smoothness: Test finished surface for smoothness even drainage, using a ten-foot to centerline of paved area. Surface will not be accepted if gaps or ridges exceed 3/16 of an inch.
5. QC/QA requirements during paving are summarized below:

<u>Activity</u>	<u>Schedule/Frequency</u>	<u>Tolerance</u>
Inspect truck beds for pooling (draindown)	every truck	NA
Take surface temp. behind joint heater	each pull	6°C (10°F) of compaction temp
Consult with Engineer to determine Locations of butt joints	as needed	NA
Test surface smoothness & positive Drainage with a 10 ft straightedge 4.5 mm (3/16")	after compaction	
Consult with Engineer to mark core Locations for QA testing	after compaction	NA

Hose test with at least 5 gpm water after compaction immediate infiltration, no puddling

1.05 SUBMITTALS

- A. Submit a list of materials proposed for work under this Section including the name and address of the materials producers and the locations from which materials are to be obtained.
- B. Submit certificates, signed by the materials producers and the relevant subcontractors, stating that materials meet or exceed the specified requirements, for review and approval by the Engineer.
- C. Submit samples of materials for review and approval by the Engineer. For mix materials, samples may be submitted only to the QA inspector with the Engineer's approval.
- D. Submittal requirements for samples and certificates are summarized in **Table 3** and discussed in further detail in the Materials section.

Table 3 – Submittal Requirements

Material or Pavement Course	Properties to be Reported of Certificate
Reservoir course	Gradation, max. wash loss, min. durability index, max. abrasion loss; air voids (reservoir course)
Geotextile Filter Fabric	Manufacturer's certification
Striping Paint	Certificate
Binder	PGAB Certificate
Course Aggregate	Gradation, wear, fractured faces, fractured & elongated
Fine Aggregate	Gradation, plasticity index
Silicone	Manufacturer's Certification
Fibers (optional)	Manufacturer's Certification
Mineral Filler (optional)	Manufacturer's Certification
Fatty amines (optional anti-strip)	Manufacturer's Certification
Hydrated lime (optional anti-strip)	Manufacturer's Certification

1.06 PROJECT CONDITIONS

- A. Site information: Data on indicated grades, utilities and other existing conditions are not intended as representations or warranties of accuracy.
- B. Existing utilities: Locate existing utilities in areas of work. If utilities are to remain in

place, provide adequate means of protection during installation of site improvements.

- C. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Landscape Architect and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
 - 1. Protect adjacent work from splashing of pavement materials. Remove all stains from exposed surfaces of pavement, structures, and grounds. Remove all waste and spillage.
 - 2. Proper erosion and sediment control practices shall be provided in accordance with existing regulations. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection through out the course of the work.
- E. The Contractor shall remove all debris, construction equipment and scrap material from areas within the limit of work prior to inspection for acceptance.
- F. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect, however, may make minor adjustments in grades and alignment as are found necessary.
- G. Contractor shall provide proof-rolls of subgrade for review by owner and landscape architect. Contractor shall also provide compaction testing prior to paving operations

PART 2 - PRODUCTS

2.01 POUROUS MEDIA INFILTRATION BEDS

- A. The porous media infiltration beds shall be as shown on the Contract Documents.
- B. Choker Course
 - 1. Choker Course shall be the same material as 'Free Draining Finishing Stone', as described in the Synthetic Turf System specification 32 18 25.
- C. 3/4" Crushed Stone
 - 2. 3/4" Crushed Stone shall be double-washed at the source facility to remove fine-grained particles and shall be well graded within the following limits:

<u>Sieve Size (ASTM D422)</u>	<u>% Passing by weight</u>
1 in.	100
3/4 in.	90-100
1/2 in.	10-50

3/8 in.	0-20
No. 4	0-5

D. Reservoir Course

1. Reservoir Course stone shall be in accordance with MassDOT M1.03.0 Gravel Borrow Type C for drainage.

E. Non-woven geotextile filter fabric (at the horizontal limits of porous asphalt only) shall be Mirafi 160N, or approved equal. Mirafi 160N is a non-woven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. 160N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

2.02 POROUS ASPHALT MIX

A. Mix Materials - Consist of modified performance grade asphalt binder (PGAB), coarse and fine aggregates, and optional additives such as silicone, fibers, mineral fillers, fatty amines, and hydrated lime. Materials shall meet the requirements of the NAPA's *Design, Construction, and Maintenance of Open-Graded Friction Courses, Information Series 115* (2002), except where noted otherwise below or approved in writing by the Engineer.

B. Polymer Modified PGAB.

1. The asphalt binder shall be a polymer modified Performance Graded asphalt binder (PGAB) used in the production of Superpave Hot Mix Asphalt (HMA) mixtures. PGAB shall be two grades stiffer than that required for dense mix asphalt (DMA) parking lot installations, which is often achieved by adding a polymer. The polymer modified binder for this project shall be a PG 76-22 SBS or a PG 76-22 SBR (i.e. the PGAB binder may be a 64-28 that is modified with either SBS or SBR to meet the PG 76-22 specification). The binder shall meet the requirements of AASHTO M320.
2. The PGAB may be pre-blended or post-blended. The pre-blended binder can be pre-blended at the source or at a terminal. For post-blended addition, the modifier can either be in-line blended or injected into the pugmill at the Plant. Based on the selected method, the following must be met:
 - a. Pre-Blended PG 76-22 SBS will be supplied by an approved PGAB supplier holding a Quality Control Plan approved by the state DOT. A Bill of Lading (BOL) will be delivered with each transport of PG 76-22 SBS. A copy of the BOL will be furnished to the QA inspector at the Plant.
 - b. Post-Blended PG 76-22 SBR will be supplied by a HMA plant approved to perform in-line blending or blending by injection into the pugmill. A Post-Blended SBR Binder Quality Control Plan (**Table 4**) will be submitted to the Engineer for approval at least 10 working days prior to production.
 - c. Quality control plans may be altered at the discretion of the Engineer and based on feasible testing as suggested by the asphalt producer. Certain QC testing requirements during production may not be

feasible for small projects in which limited asphalt is generated. Some testing methods cannot be completed during the time needed during small batch production. The feasibility should be assessed with the Engineer and producer.

Table 4. Post-Blended SBR Binder QC Plan requirements.

<p><u>The QC Plan will contain:</u></p> <ol style="list-style-type: none"> 1. Company name and address 2. Plant location and address 3. Type of Facility 4. Contact information for the Quality Control Plan Administrator 5. QC Tests to be performed on each PGAB 6. Name(s) of QC Testing Lab to perform QC and Process Control testing. 7. Actions to be taken for PG Binders and SBR in Non compliance 8. List of mechanical controls (requirements below) 9. List of process controls and documentation (requirements below)
<p><u>List of Mechanical Controls</u></p> <ol style="list-style-type: none"> 1. Liquid SBR no-flow alert system with an "alert" located in the control room and automatic documentation of a no flow situation on the printout 2. Provide means of calibrating the liquid SBR metering system to a delivery tolerance of 1%. 3. A batching tolerance at the end of each day's production must be within 0.5% of the amount of SBR solids specified. 4. Mag-flow meter (other metering system may be considered) 5. Method of sampling liquid SBR
<p><u>List of Process Controls and Documentation</u></p> <ol style="list-style-type: none"> 1. Printouts of liquid SBR and PG binder quantities must be synchronized within one minute of each other 2. SBR supplier certification showing the percent of SBR solids in liquid SBR 3. Test results of a lab sample blended with the specified dosage of SBR. At a minimum, provide the name of the PGAB and liquid SBR suppliers, and PGAB information such as grade and lot number, and SBR product name used for the sample. 4. MSDS sheet for liquid SBR 5. Handling, storage, and usage requirements will be followed as required by the liquid SBR manufacturer 6. At a minimum, provide a table showing proposed rate of SBR liquid (L/min.) in relation to HMA production rate (tons per hour, TPH) for the % solids in liquid SBR, quantity of SBR specified for HMA production, and the specific gravity of the SBR. 7. QCT or QC Plan Administrator must be responsible for documenting quantities, ensuring actual use is within tolerance, etc. All printouts, calculations, supplier certifications etc. must be filed and retained as part of the QCTs daily diary/reports. 8. Method and Frequency of testing at the HMA plant, including initial testing and specification testing.

*This Plan shall be submitted to the Engineer 10 days before production.

C. Anti-Stripping Mix Additives.

1. The mix shall be tested for moisture susceptibility and asphalt stripping from the aggregate by AASHTO T283. If the retained tensile strength (TSR) < 80% upon testing, a heat stable additive shall be furnished to improve the anti-stripping properties of the asphalt binder. Test with one freeze-thaw cycle (rather than five recommended in *NAPA IS 115*). The amount

and type of additive (e.g. fatty amines or hydrated lime) to be used shall be based on the manufacturer's recommendations, the mix design test results, and shall be approved by the Engineer.

2. Silicone shall be added to the binder at the rate of 1.5 mL/m³ (1 oz. per 5000 gal).
3. Fibers may be added per manufacturer and *NAPA IS 115* recommendation if the draindown requirement cannot be met (<0.3% via ASTM D6390) provided that the air void content requirement is met (>18%, or >16% as tested with CoreLok device).
4. Additives should be added per the relevant DOT specification and *NAPA IS 115*.

D. Porous Asphalt Mix Design.

1. The Contractor shall submit a mix design at least 10 working days prior to the beginning of production. The Contractor shall make available samples of coarse aggregate, fine aggregate, mineral filler, fibers and a sample of the PGAB that will be used in the design of the mixture. A certificate of analysis (COA) of the PGAB will be submitted with the mix design. The COA will be certified by a laboratory meeting the requirements of AASHTO R18. The Laboratory will be certified by the state DOT, regional equivalent (e.g. NETTCP), and/or qualified under ASTM D3666. Technicians will be certified by the regional certification agency (e.g. NETTCP) in the discipline of HMA Plant Technician.
2. The mixture will be designed according to the *NAPA IS 131*, with the exception of testing for air void content. Bulk specific gravity (SG) used in air void content calculations shall not be determined and results will not be accepted using AASHTO T166 (saturated surface dry), since it is not intended for open graded specimens (>10% AV). Bulk SG shall be calculated using AASHTO T275 (paraffin wax) or ASTM D6752 (automatic vacuum sealing, e.g. CoreLok). Air void content shall be calculated from the bulk SG and maximum theoretical SG (AASHTO T209) using ASTM D3203.
3. The materials shall be combined and graded to meet the composition limits by mass (weight) as follows:

U.S. Standard Sieve Size	Percent Passing (%)	
	Minimum	Maximum
3/4 in.	100	--
1/2 in.	85	100
3/8 in.	55	75
No. 4	10	25
No. 8	5	10
No. 200	2	4

Binder Content (AASHTO T164) 6.0-6.5%

Air Void Content by Corelok (ASTM D6752)* 16.0-20.0%

Air Void Content by Paraffin wax (AASHTO T275)* 18.0-22.0%

Draindown (ASTM D6390)** <= 0.3 %

Retained Tensile Strength (AASHTO 283)*** >= 80 %

* Either method is acceptable

**Cellulose or mineral fibers may be used to reduce draindown.

***If the TSR (retained tensile strength) values fall below 80% when tested per NAPA IS 131

(with a single freeze thaw cycle rather than 5). Step 4, the contractor shall employ an antistrip additive, such as hydrated lime (ASTM C977) or a fatty amine, to raise the TSR value above 80%.

2.03 POROUS ASPHALT UNDERDRAIN

- A. Porous Asphalt Underdrain shall be a 4" perforated PVC pipe wrapped with filter fabric.

PART 3 – EXECUTION

3.01 POROUS MEDIA BEDS

- A. Grade Control
 - 1. Establish and maintain required lines and elevations, no less than 1/8" off the grade plane. The Engineer shall be notified for review and approval of final stake lines for the work before construction work is to begin. Finished surfaces shall be true to grade and even, free of roller marks and free of low spots to form puddles. All areas must drain.
 - 2. If, in the opinion of the Engineer, based upon reports of the testing service and inspection, the quality of the work is below the standards which have been specified, additional work and testing will be required until satisfactory results are obtained.
- B. The Engineer shall be notified at least 24 hours prior to all porous media bed and porous pavement work.
- C. Subgrade preparation
 - 1. Refer to Infilled Synthetic Turf System Specification.
- D. Porous Media Bed Installation
 - 1. Refer to Infilled Synthetic Turf System Specification.

3.02 POROUS ASPHALT MIX PRODUCTION

- A. Mixing Plants
 - 1. Mixing plants shall meet the requirements of hot mix asphalts plants as specified in the state DOT or regional equivalent unless otherwise approved by the engineer.
- B. Preparation of Asphalt Binder
 - 1. The asphalt material shall be heated to the temperature specified in the state DOT specification (if using DOT spec for the mix) in a manner that will

avoid local overheating. A continuous supply of asphalt material shall be furnished to the mixer at a uniform temperature.

C. Preparation of Aggregates

1. The aggregate for the mixture shall be dried and heated at the mixing plant before being placed in the mixer. Flames used for drying and heating shall be properly adjusted to avoid damaging the aggregate and depositing soot or unburned fuel on the aggregate.
2. Mineral filler, if required to meet the grading requirements, shall be added in a manner approved by the Engineer after the aggregate have passed through the dryer.
3. The above preparation of aggregates does not apply for drum-mix plants.

D. Mixing

1. The dried aggregates shall be combined in the mixer in the amount of each fraction of aggregate required to meet the job-mix formula and thoroughly mixed prior to adding the asphalt material. The dried aggregates shall be combined with the asphalt material in such a manner as to produce a mixture that when discharged from the pugmill is at a target temperature in the range that corresponds to an asphalt binder viscosity of 700 to 900 centistokes and within a tolerance of $\pm 11^{\circ}\text{C}$ ($\pm 20^{\circ}\text{F}$).
2. The asphalt material shall be measured or gauged and introduced into the mixer in the quantity determined by the Engineer for the particular material being used and at the temperature specified in the relevant specification.
3. After the required quantity of aggregate and asphalt material has been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the asphalt material throughout the aggregate is secured. The mixing time will be regulated by the Engineer, and a suitable locking means shall be provided for these regulations.
4. All plants shall have a positive means of eliminating oversized and foreign material from being incorporated into the mixer.

3.03 POROUS ASPHALT PAVEMENT INSTALLATION

- A. The mixing plant, hauling and placing equipment, and construction methods shall be in conformance with NAPA IS 131 and applicable sections of the state DOT's specification for asphalt mixes.
- B. The use of surge bins shall not be permitted.
- C. Hauling Equipment. Trucks used for hauling asphalt mixture shall have tight, clean, smooth metal bodies. The Contractor shall apply a thin coat of a non-petroleum based or soap solution to prevent the mixture from adhering to the bodies.
- D. Each truck shall have a cover of canvas or other suitable material of such size sufficient to protect the mixture from the weather. When necessary to ensure

delivery of material at the specified temperature, truck bodies shall be insulated, and covers shall be securely fastened.

E. Placing Equipment

1. The paver shall be a laser graded self-propelled unit with an activated screed or strike-off assembly, capable of being heated if necessary, and capable of spreading and finishing the mixture without segregation for the widths and thicknesses required. The screed shall be adjustable to provide the desired cross-sectional shape. The finished surface shall be of uniform texture and evenness and shall not show any indication of tearing, shoving, or pulling of the mixture. The machine shall, at all times, be in good mechanical condition and shall be operated by competent personnel.
2. Pavers shall be equipped with the necessary attachments, designed to operate electronically, for controlling the grade of the finished surface.
3. The adjustments and attachments of the paver will be checked and approved by the Engineer before placement of asphalt material.
4. Pavers shall be equipped with a sloped plate to produce a tapered edge at longitudinal joints. The sloped plate shall be attached to the paver screed extension.
5. The sloped plate shall produce a tapered edge having a face slope of 1:3 (vertical: horizontal). The plate shall be so constructed as to accommodate compacted mat thickness from 35 to 100 mm (1 1/4 to 4 inches). The bottom of the sloped plate shall be mounted 10 to 15 mm (3/8 to 1/2 inch) above the existing pavement. The plate shall be interchangeable on either side of the screed.
6. Pavers shall also be equipped with a joint heater capable of heating the longitudinal edge of the previously placed mat to a surface temperature of 95 °C (200 °F), or higher if necessary, to achieve bonding of the newly placed mat with the previously placed mat. This shall be done without undue breaking or fracturing of aggregate at the interface. The surface temperature shall be measured immediately behind the joint heater. The joint heater shall be equipped with automated controls that shut off the burners when pavement machine stops and reignite them with the forward movement of the paver. The joint heater shall heat the entire area of the previously placed wedge to the required temperature. Heating shall immediately precede placement of the asphalt material.

F. Rollers

1. Roller shall be steel drum and non-vibratory.
2. Rollers shall be in good mechanical condition, operated by competent personnel, capable of reversing without backlash, and operated at speeds slow enough to avoid displacement of the asphalt mixture. The mass (weight) of the rollers shall be sufficient to compact the mixture to the required density without crushing of the aggregate. Rollers shall be equipped with tanks and sprinkling bars for wetting the rolls.
3. Rollers shall be two-axle tandem rollers with a gross mass (weight) of not less than 7 metric tons (8 tons) and not more than 10 metric tons (12 tons) and shall be capable of providing a minimum compactive effort of 44

- kN/m (250 pounds per inch) of width of the drive roll. All rolls shall be at least 1 m (42 inches) in diameter.
4. A rubber tired roller will not be required on the open graded asphalt friction course surface.
- G. Conditioning of Existing Surface. Contact surfaces such as curbing, gutters, and manholes shall be painted with a thin, uniform coat of Type RS-1 emulsified asphalt immediately before the asphalt mixture is placed against them.
- H. Spreading and Finishing
1. The asphalt mixture shall be spread in two (2) lifts.
 2. The asphalt mixture, at the time of discharge from the haul vehicle, shall be within 6 °C (10 °F) of the compaction temperature for the approved mix design.
 3. The Contractor shall protect all exposed surfaces that are not to be treated from damage during all phases of the pavement operation.
 4. The asphalt mixture shall be spread and finished with the specified equipment. The mixture shall be struck off in a uniform layer to the full width required and of such depth that each course, when compacted, has the required thickness and conforms to the grade and elevation specified. Pavers shall be used to distribute the mixture over the entire width or over such partial width as practical. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture shall be spread and raked by hand tools.
 5. No material shall be produced so late in the day as to prohibit the completion of spreading and compaction of the mixture during daylight hours, unless night paving has been approved for the project.
 6. No traffic will be permitted on material placed until the material has been thoroughly compacted and has been permitted to cool to below 60 °C (140 °F). The use of water to cool the pavement will not be permitted. The Engineer reserves the right to require that all work adjacent to the pavement, such as guardrail, cleanup, and turf establishment, is completed prior to placing the wearing course when this work could cause damage to the pavement. On projects where traffic is to be maintained, the Contractor shall schedule daily pavement operations so that at the end of each working day all travel lanes of the roadway on which work is being performed are paved to the same limits. Suitable aprons to transition approaches where required shall be placed at side road intersections and driveways as directed by the Engineer.
- I. Compaction
1. Immediately after the asphalt mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.
 2. The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving.

3. The number, mass (weight), and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. Generally, one breakdown roller will be needed for each paver used in the spreading operation.
4. To prevent adhesion of the mixture to the rolls, rolls shall be kept moist with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.
5. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons or with mechanical tampers. On depressed areas, either a trench roller or cleated compression strips may be used under the roller to transmit compression to the depressed area.
6. Other combinations of rollers and/or methods of compacting may be used if approved in writing by the Engineer, provided the compaction requirements are met.
7. Unless otherwise specified, the longitudinal joints shall be rolled first. Next, the Contractor shall begin rolling at the low side of the pavement and shall proceed towards the center or high side with lapped rollings parallel to the centerline. The speed of the roller shall be slow and uniform to avoid displacement of the mixture, and the roller should be kept in as continuous operation as practical. Rolling shall continue until all roller marks and ridges have been eliminated.
8. The Contractor shall take special care not to over-compact the asphalt material during rolling operations. Material that is over compacted so that it no longer infiltrates will be rejected, and will be replaced at the Contractor's expense.
9. Rollers will not be stopped or parked on the freshly placed mat.
10. It shall be the responsibility of the Contractor to conduct whatever process control the Contractor deems necessary. Acceptance testing will be conducted by the Engineer using cores provided by the Contractor.
11. Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture. The mixture shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of binder shall be removed and replaced. These replacements shall be at the Contractor's expense. Vibratory rollers shall not be used.
12. If the Engineer determines that unsatisfactory compaction or surface distortion is being obtained or damage to highway components and/or adjacent property is occurring using vibratory compaction equipment, the Contractor shall immediately cease using this equipment and proceed with the work in accordance with the fourth paragraph of this Subsection.
13. The Contractor assumes full responsibility for the cost of repairing all damages that may occur to roadway or parking lot components and adjacent property if vibratory compaction equipment is used. After final rolling, no vehicular traffic of any kind shall be permitted on the surface until cooling and hardening has taken place, and in no case within the first 48 hours. Provide barriers as necessary at no extra cost to the Owner to prevent vehicular use; remove at the discretion of the Engineer.

J. Joints

1. Joints between old and new pavements or between successive day's work shall be made to ensure a thorough and continuous bond between the old and new mixtures. Whenever the spreading process is interrupted long enough for the mixture to attain its initial stability, the paver shall be removed from the mat and a joint constructed.
2. Butt joints shall be formed by cutting the pavement in a vertical plane at right angles to the centerline, at locations approved by the Engineer. The Engineer will determine locations by using a straightedge at least 4.9 m (16 feet) long. The butt joint shall be thoroughly coated with Type RS-1 emulsified asphalt just prior to depositing the pavement mixture when pavement resumes.
3. Tapered joints shall be formed by tapering the last 450 to 600 mm (18 to 24 inches) of the course being laid to match the lower surface. Care shall be taken in raking out and discarding the coarser aggregate at the low end of the taper, and in rolling the taper. The taper area shall be thoroughly coated with Type RS-1 emulsified asphalt just prior to resuming pavement. As the paver places new mixture on the taper area, an evenly graduated deposit of mixture shall complement the previously made taper. Shovels may be used to add additional mixture if necessary. The joint shall be smoothed with a rake, coarse material discarded, and properly rolled.
4. Longitudinal joints that have become cold shall be coated with Type RS-1 emulsified asphalt before the adjacent mat is placed. If directed by the Engineer, joints shall be cut back to a clean vertical edge prior to applying the emulsion.

K. Surface Tolerances

1. After the installation of each lift, the surface will be tested by the Engineer using a straightedge at least 4.9 m (16 feet) in length at selected locations parallel with the centerline. Any variations exceeding 3 mm (1/8 inch) between any two contact points shall be satisfactorily eliminated. A straightedge at least 3 m (10 feet) in length may be used on a vertical curve. The straightedges shall be provided by the Contractor.

L. Work shall be done expertly throughout, without staining or injury to other work. Transition to adjacent impervious asphalt pavement shall be merged neatly with flush, clean line. Finished pavement shall be even, without pockets, and graded to elevations shown on drawing.

M. Porous pavement beds shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.

N. Repair of Damaged Pavement. Any existing pavement on or adjacent to the site has been damaged as a result of construction work shall be repaired to the satisfaction of the Engineer without additional cost to the Owner.

END OF SECTION

SECTION 32 13 13
CEMENT CONCRETE PAVEMENT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Concrete walks and pavements, sidewalks, ramps, and pads.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Loam and Seed

1.04 REFERENCES

- A. Work shall conform to codes and standards of the following:
 - 1. Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (MassDOT Specifications).
 - 2. American Concrete Institute (ACI):
 - a. Specifications for Structural Concrete for Buildings
 - b. 305R Hot Weather Concreting
 - c. 306R Cold Weather Concreting
 - d. 316R Recommendations for Construction of Concrete Pavements and Concrete Bases.
 - 3. American Society for Testing and Materials (ASTM):
 - a. A 185 Welded Steel Wire Fabric for Concrete Reinforcement

- b. C 33 Concrete Aggregates
 - c. C 94 Ready-Mixed Concrete
 - d. C 143 Slump of Portland Cement Concrete
 - e. C 150 Portland Cement
 - f. C 171 Sheet Materials for Curing Concrete
 - g. C 231 Air Content of Freshly Mixed Concrete by the Pressure Method
 - h. C 260 Air Entraining Admixtures for Concrete
 - i. C 309 Liquid Membrane-Forming Compounds for Curing Concrete
 - j. C 494 Chemical Admixtures for Concrete
 - k. D 226 Asphalt-Saturated Organic Roofing Felt for Use in Membrane Waterproofing and Built-Up Roofing
 - l. D 1557 Moisture - Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54-kg) Rammer and 18-in. (457 mm) Drop
 - m. D 1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
4. Americans with Disabilities Act (ADA): Appendix to Part 1191 Accessibility Guidelines for Buildings and Facilities

1.05 QUALITY ASSURANCE

- A. Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 316R.
- B. Paving work, base course etc., shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.
- C. Existing paving areas shall, if damaged or removed during course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.
- D. Pavement, base, or sub-base shall not be placed on a muddy or frozen sub-grade.
- E. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work.

1.06 ADA AND MAAB COMPLIANCE

- A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
 - 1. Slopes: All Walkways as defined by Section 22.1 of 521 CMR shall be graded to a maximum 4.5%. The cross pitch (perpendicular to travel) for all walkways and paths shall be constructed at 1.5%. The slope of all ramps and side slopes of handicap curb cuts as defined by Section 21.1 of 521 CMR shall be constructed at 7% maximum. Ramps as defined in section 24.1 of 521 CMR shall be constructed to a maximum slope of 7%.
 - 2. The Contractor is to assume that all grades in pedestrian paths of travel shall be verified/checked with a 2-foot electronic "Smart Level".
 - 3. A 5'-0" minimum level (1.5% pitch) area shall be provided at all flush entrances to buildings. Puddling of water at the entrances will not be allowed.
- B. The above requirements shall supercede the grades shown on the plans. If these requirements cannot be met with the grades shown on the plans, the architect shall be notified immediately for direction.

1.07 SUBMITTALS

- A. Submit manufacturer's product data for the following:
 - 1. Preformed joint filler.
- B. Submit samples of the following:
 - 1. For cement concrete paving show expansion joints, tooling and finish. Minimum 6' x 6' sample panel.
 - 2. Preformed joint filler.

PART 2 – PRODUCTS

2.01 AGGREGATE BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
 - 1. Material shall conform to MassDOT Specifications Section M1.03.0 type b, with less than 8% by weight passing the No. 200 sieve.

2.02 STEEL REINFORCEMENT

- A. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.03 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete for pavements and slabs shall be air-entrained type with a maximum water-cement ratio of 5.0 conforming to ACI 316R. Minimum compressive strengths at 28 days shall be as follows: Flexural strength with third point loading - 650 psi; compressive strength - 4000 psi.
 - 1. Concrete shall be air-entrained type, conforming to ASTM C 94. Air content by volume shall be $6\% \pm 1\%$, and shall be tested in accordance with ASTM C 231.
 - 2. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.
 - 3. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II. Only one color of cement, all of the same manufacturer, shall be used for the work. Type III cement shall be used only with the prior approval of the Owner's Representative.
 - 4. Fine and coarse aggregates shall conform to ASTM C 33.
 - 5. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.
 - 6. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Owner's Representative in each case.

2.04 CURING MATERIALS

- A. Curing shall be by moist curing or by use of curing compound.
- B. Curing paper shall be non-staining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.
- C. Curing compound shall be a resin-base, white pigmented compound conforming to ASTM C 309, Type 2.

2.05 EXPANSION JOINTS

- A. Unless otherwise indicated on the Drawings, expansion joints shall be located 30 ft. o.c., maximum.

- B. Expansion joint filler shall be preformed, non-bituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., Elgin, IL 60120, or approved equal.
1. Pre-molded filler shall be one piece for the full depth and width of the joint leaving a sealant recess as indicated.
 2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
 3. Except as otherwise noted on the Drawings, joint filler shall be 1/2 in. thick.
- C. Expansion joint shall receive joint backer rod and shall be sealed with joint sealant.

2.06 CONTROL JOINTS

- A. Control joints indicated to be tooled shall be made by scoring concrete slab after finishing of slab, with scoring tool which will cut into slab at least 1 in., but in no case less than 25% of slab depth.

2.07 CONSTRUCTION JOINTS

- A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.
1. Butt joint with dowels or thickened edge joint shall be used if construction joints occurs at location of control joint.
 2. Keyed joints with tiebars shall be used if the joint occurs at any other location.

2.08 GROUT

- A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.
- B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRDC 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.
1. Non-shrink grout shall be one of the following, or approved equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco

U.S. Grout Corporation	Five Star Grout
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2.09 BOND BREAKER

- A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6 mil polyethylene sheeting.

PART 3 – EXECUTION

3.01 PREPARATION OF SUBGRADE

- A. Areas to be paved will be compacted and brought to sub-grade elevation under Section 31 00 00, EARTHWORK before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding sub-grade at required elevations and to required lines, shall be done under this Section.
- B. Existing sub-grade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring sub-grade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.
- C. Sub-grade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction at optimum moisture of at least 95% of maximum density, as determined by ASTM D 1557. Sub-grade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement sub-grade shall be completed before fine grading and final compaction of sub-grade are performed. Where excavation must be performed in completed sub-grade, sub-base, base, or pavement, subsequent backfill and compaction shall be performed as directed by the Owner's Representative as specified in Section 31 00 00, EARTHWORK. Completed sub-grade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in sub-grade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on sub-grade.
- G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.
- H. Prepared sub-grade will be inspected by the Owner's Representative. Sub-grade shall be approved by the Owner's Representative before installation of gravel base course. Disturbance to sub-grade caused by inspection procedures shall be repaired under this section of the specification.

3.02 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following: MassDOT Specifications Section 405, "Gravel Base Course".
- B. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- C. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. as measured by means of a 10 ft. long straightedge, shall be replaced and properly recompact.
- D. Base course shall be compacted at optimum moisture content to not less than 95% of maximum density as determined by ASTM D 1557.
- E. Sub-grade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of sub-grade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 STEEL REINFORCEMENT

- A. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.
- B. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.

- C. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Owner's Representative.

3.04 PORTLAND CEMENT CONCRETE PAVING

- A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 316R. Pavement shall be constructed in accordance with the Drawings.
- B. The Owner's Representative shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including sub-grade, forms, and reinforcing steel, if used.
- C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Owner's Representative must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.
- D. Work shall not be performed during rainy weather or when temperature is less than 40 degrees F. (4.4 degrees C).
- E. Adjacent work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.
- F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.
- G. Concrete which has set or partially set before placing shall not be employed. Re-tempering of concrete will not be permitted.
- H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
- I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.05 FINISHING

- A. Concrete flatwork surfaces shall be screeded off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.
 - 1. Finished concrete surface for subbases shall be woodfloated to a slightly rough surface. Surface shall not deviate more than 1/4 in. in 10 ft.
 - 2. Finished concrete surface for concrete walks and pads shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8 in. in 10 ft.
- B. Unless otherwise indicated, horizontal surfaces of concrete surfaces which will be exposed shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete band, slab, or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across it to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation.
- C. Immediately following finishing operations, arises at edges and both sides of expansion joints shall be rounded to a 1/4 in. radius. Control joints to be tooled shall be scored into slab surface with scoring tool. Adjacent edges of control joint shall at same time be finished to a 1/4 in. radius.
- D. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.06 CURING

- A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.
- B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.
 - 1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.
3. Curing period shall be seven days minimum.

3.07 EXPANSION JOINTS

- A. Expansion joints shall be 1/2 in. wide and shall be as located on the Drawings. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint.
 1. For concrete pavements and pads, depth of joint filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished concrete surface.

3.08 CONTROL JOINTS

- A. Unless otherwise indicated, control joints to be tooled shall be scored into the concrete slab every 10 ft. o.c. maximum. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set.

3.09 COLD WEATHER CONCRETING

- A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40 degrees F. or is expected to fall to below 40 degrees F. within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Owner's Representative. Procedures shall be in accordance with provisions of ACI 306R.

3.10 HOT WEATHER CONCRETING

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (95 degrees F, or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95 degrees F, when ready for placement will not be acceptable, and will be rejected.
- C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy,

etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.11 PROTECTION OF CONCRETE SURFACES

- A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.

END OF SECTION

SECTION 32 14 14
PERMEABLE PAVERS

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

- 1. Concrete unit pavers.
- 2. Stone base and setting bed.
- 3. Sand setting bed.

1.03 SUBMITTALS

- A. Manufacturer's Product Data: Manufacturer's product data shall be submitted for each type of product specified.
- B. Samples:
 - 1. Pavers: Submit a minimum of five individual unit pavers, showing extreme variations in color and texture.
 - 2. Sand: Submit a 1 lb. bag.
 - 3. Joint filler.
- C. Test Report for Precast Concrete Unit Pavers:
 - 1. Testing shall be done by an independent testing laboratory. Test procedures shall conform to ASTM C 936 methods, where applicable.
 - a. Test report shall indicate, as a minimum, the following:
 - b. Compressive strength, psi.
 - c. Absorption, 5 hr. submersion in cold water.
 - d. Absorption, 24 hr. submersion in cold water.

- e. Maximum saturation coefficient.
- f. Initial rate of absorption (suction).
- g. Abrasion index.
- h. Freeze-thaw.

1.04 ACCESSIBILITY COMPLIANCE

- A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
 - 1. Slopes: The cross pitch (perpendicular to travel) for walkways shall be constructed at 1.5% (2% maximum, 1% minimum). The longitudinal slope (parallel to travel) for walkways shall not exceed 4.5%. The slope of handicapped curb cuts shall be constructed at 7% (8% maximum).
 - 2. Verify slopes with a 2-foot electronic "Smart Level". Pedestrian pavements that do not meet these requirements shall be replaced at the Contractor's expense.
- B. These requirements supercede the grades shown on the plans. If these requirements cannot be met with the grades shown on the plans, notify the Owner's representative immediately for direction.
- C. The location and construction of handicapped curb cuts shall be reviewed and approved by the Municipal Engineer prior to construction.

1.05 PROJECT CONDITIONS

- A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's Representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
- B. The Contractor shall remove all debris, construction equipment and waste material from areas within the limit of work prior to inspection for acceptance.
- C. The Drawings indicate, in general, the alignment and finished grade elevations. The Owner's Representative, however, may make minor adjustments in grades and alignment as are found necessary.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Unit pavers shall be carefully packed by the supplier for shipment.
- B. Pavers shall be stored off the ground and protected against staining and other damage.

- C. Aggregate materials shall be kept dry and free from soiling.
- D. Pavers damaged in any manner will be rejected and replaced with new materials at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 UNIT PAVERS

- A. Unit pavers shall be Enduracolor Artline pavers by Unilock, or approved equal. Sizes shall be in the manufacturers standard range of sizes. Color: 70% Tuscany, 30% Steel Mountain. Refer to Drawings for layout pattern.
- B. Contractor shall provide representative selections and samples to the satisfaction of the Landscape Architect.
- C. Unit pavers shall conform to ASTM C-902, Class SX, Application PA requirements.

2.02 UNIT PAVER SPACERS

- A. Unit Paver laying pattern shall include "L" shaped spacers as supplied by Unilock commercial.unilock.com, or approved equal.

2.03 PERMEABLE JOINT OPENING AGGREGATE

- A. Provide Permeable Joint Opening Aggregate materials conforming to ASTM C 33 and gradation requirements as shown below (granite chips):

1/8 to 3/16 inch granite chips	
Sieve Size	Percent Passing
1/4 in (6 mm)	97 to 100
No. 4 (4.75 mm)	50 to 60
No. 8 (2.36 mm)	0 to 3
No. 16 (1.18 mm)	0 to 2
pan	

- B. Color to be selected by Owner Representative from full range.

2.04 PERMEABLE SETTING BED AGGREGATE

- A. Provide Permeable Setting Bed Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No.8 as shown below:

ASTM No. 8	
Sieve Size	Percent Passing
½ in (12.5 mm)	100

3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

2.05 FREE DRAINING STONE BASE RESERVOIR COURSE

- A. Permeable Base Aggregate materials shall be double washed and shall conform to ASTM C 33 and gradation requirements of ASTM D 448 No.57 as shown below:

ASTM No. 57	
Sieve Size	Percent Passing
1-1/2 in (37.5 mm)	100
1 in (25 mm)	95 to 100
1/2 in (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

2.06 FILTER FABRIC

- A. Filter fabric shall be a needle punched nonwoven geotextile composed of polypropylene fibers. Mirafi 140N or approved equal.

PART 3 – EXECUTION

3.01 PERMEABLE PAVERS

A. EXAMINATION

1. Landscape Architect shall be present during installation of permeable pavers to approve pattern and proper installation.
2. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance before placing the Permeable Concrete Pavers.
 - i. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
 - ii. Verify that filter fabric has been placed according to drawings and specifications.
 - iii. Verify that Permeable Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.

- iv. Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. PREPARATION

1. Verify that the subgrade soil is free from standing water.
2. Stockpile Permeable Setting Bed, Joint and Base Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
3. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the aggregate materials.
4. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all filter fabric, Permeable Joint, Setting Bed and Base Aggregate materials contaminated with sediment with clean materials.
6. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.

C. INSTALLATION

1. FREE DRAINING STONE BASE RESERVOIR COURSE

- i. Refer to 02630 STORM DRAINAGE UTILITIES for installation of perforated pipe, if applicable.
- ii. Provide the Permeable Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Permeable Subbase Aggregate material and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.
- iii. Compact the Permeable Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the compaction device.
- iv. Tolerance: Do not exceed the specified surface grade of the compacted Permeable Base Aggregate material more than $\pm 1/2$ in. (13 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
- v. Grade and compact the upper surface of the Permeable Base Aggregate material sufficiently to prevent infiltration of the Permeable Setting Bed Aggregate material both during construction and throughout its service life.

2. PERMEABLE SETTING BED AGGREGATE

- i. Provide and spread Permeable Setting Bed aggregate evenly over the Permeable Base Aggregate course and screed to a nominal thickness of 1-1/2 in. (40 mm).
1. Do not disturb screeded Permeable Setting Bed Aggregate.

2. Do not substantially exceed screed area which cannot be covered by pavers in one day.
 3. Do not use Permeable Setting Bed Aggregate material to fill depressions in the base surface.
- ii. Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.
 - iii. Inspect the Permeable Setting Bed Aggregate course prior to commencing the placement of the permeable concrete pavers.
 - iv. Inspect the Setting Bed Aggregate course prior to commencing the placement of the Permeable Concrete Pavers. Acceptance of the Setting Bed Aggregate occurs with the initiation of Permeable Concrete Paver placement.

3. PERMEABLE PAVERS

- i. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
- ii. Mix Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures.
- iii. Exercise care in handling face mix pavers to prevent surfaces from contacting backs or edges of other units.
- iv. Provide Pavers using joint pattern as indicated. Adjust joint pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed no smaller than one-third of a whole paver.
- v. Use string lines or chalk lines on Permeable Setting Bed aggregate to hold all pattern lines true.
- vi. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
- vii. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- viii. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
- ix. Do not exceed joint (bond) lines more than $\pm 1/2$ in. (± 15 mm) over 50 ft. (15 m) from string lines.
- x. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
- xi. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- xii. Do not allow traffic on installed pavers until Permeable Joint Aggregate has been vibrated into joints. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and Permeable Joint Aggregate material.
- xiii. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
 1. After edge pavers are installed and there is a completed surface.

2. Compact installed concrete pavers to within 6 feet (1,800 mm) of the laying face before ending each day's work. Cover pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Permeable Setting Bed Aggregate from becoming disturbed.
- xiv. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
- xv. Remove any cracked or structurally damaged pavers and replace with new units prior to installing Permeable Joint Opening Aggregate material.
- xvi. Provide, spread and sweep Permeable Joint Opening Aggregate into joints immediately after vibrating pavers into Permeable Setting Bed course until full. Vibrate pavers and add Permeable Joint Aggregate material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
- xvii. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage). Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- xviii. Remove excess Permeable Joint Aggregate broom clean from surface when installation is complete.

D. FIELD QUALITY CONTROL

1. Verify final elevations for conformance to the drawings after sweeping the surface clean.
 - i. Do not deviate final surface tolerance from grade elevations more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
2. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
3. Lippage: No greater than 1/8 in. (3 mm) difference in height between Permeable Concrete Pavers and adjacent paved surfaces.

E. REPAIRING, CLEANING AND SEALING

1. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
2. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
 - i. Clean Permeable Concrete Pavers in accordance with the manufacturer's written recommendations.

F. PROTECTION

1. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 32 15 40
STABILIZED STONE DUST

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
- B. Provide crushed aggregate screenings/stone dust (CAS) paving with organic binder.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's current catalog cuts and specifications for crushed aggregate screenings and organic stabilizer.
- B. Samples: Half a pound for each size and color range of crushed aggregate screenings.

1.04 QUALITY ASSURANCE

- A. Unless otherwise specified, work and materials for construction of the stone dust paving shall conform to the applicable portions of the following:
 - 1. MassDOT Specifications Section M2 for Aggregates and Related Materials and M2.05.0 for Stone Screenings.
- B. Codes and Standards: Perform site improvement work in compliance with applicable requirements of governing authorities having jurisdiction.
- C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. Layout and Grading: After staking and laying out the work, and before beginning final construction, obtain the Owner's Representative's approval of layout and grades. Contractor shall make minor adjustments as determined by the Owner's Representative.

- E. The Contractor and his Subcontractors shall inspect all subbases for unstable, unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be held responsible for any corrections required to properly implement the Construction Documents.
- F. Testing Agency: Selected by Owner and paid for by the Contractor.

1.05 ACCESSIBILITY COMPLIANCE

- A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
- B. Slopes: The cross pitch (perpendicular to travel) for walkways shall be constructed at 1.5% (2% maximum, 1% minimum). The longitudinal slope (parallel to travel) for walkways shall not exceed 4.5%. The slope of handicapped curb cuts shall be constructed at 7% (8% maximum).
- C. Verify slopes with a 2-foot electronic "Smart Level". Pedestrian pavements that do not meet these requirements shall be replaced at the Contractor's expense.
- D. These requirements supercede the grades shown on the plans. If these requirements cannot be met with the grades shown on the plans, notify the Owner's representative immediately for direction.
- E. The location and construction of handicapped curb cuts shall be reviewed and approved by the Municipal Engineer prior to construction.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not install crushed aggregate screenings during rain or while subbase is wet from rain. Do not apply soil sterilant when winds exceed 10 mph or during or after rain.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Protect crushed aggregate screenings from contamination with foreign materials. Isolate stockpiles to prevent mixing of different aggregate grades. Prevent contamination with organic materials.

1.08 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install work under this section prior to acceptance of the subgrade preparation under another section.
- B. Coordination: Coordinate with other trades to insure a proper installation schedule.

1.09 MAINTENANCE

- A. Service: Immediately repair all damage to the work as the result of weather or traffic conditions. Report all damage resulting from work of other trades after acceptance of crushed aggregate screenings work. Repair to match adjacent undisturbed work.

PART 2 - PRODUCTS

2.01 CRUSHED AGGREGATE SCREENINGS (CAS)

- A. Crushed Aggregate Screenings/Stone Dust shall conform to the following analysis: Color to be selected by the Owner's Representative.

Sieve Size	Percent Passing (%)
3/8"	100
#4	75 - 100
#100	10 - 30

- B. Organic Binder:

- 1. Product: "Stone Dust Stabilizer" as manufactured by Stabilizer Solutions Inc., 33 South 28th Street, Phoenix, AZ 85034, (800) 336-2468 or approved equal.

- C. The CAS and the organic binder shall be mixed off-site and delivered as a homogenous mix for installation.

2.02 EQUIPMENT

- A. Mixing Equipment: Batch-type, using revolving blades or rotary drum.
- B. Compaction Equipment: Power roller weighing not less than 5 tons.

2.03 ACCESSORIES

- A. Water: Fresh, clean, potable water as available from Owner or transported as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Subgrades shall have been rough graded to within 0.10 ft. of finish grades less depth of crushed stone paving.
- B. Verify that the adjacent paving or surfacing has been installed and accepted under another Section prior to commencement of work.

3.02 PREPARATION

- A. Compaction: After completion of soil sterilization, compact subgrade to a minimum of 95% compaction.

3.03 INSTALLATION

A. Stone Dust Paving

1. If the dump truck delivering the Stabilized CAS is able to back-up to the prepared base, it is advisable to dump the first load at the entrance, spread by grading all Stabilized CAS onto the base in a pushing mode and continue in this manner so the delivery vehicles reverse over the graded Stabilized CAS to dump but do not actually travel directly onto prepared base.
2. Lines and Levels: Install all crushed stone work true to grade, properly coinciding with adjacent work and elevations. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than 1/8" in 10' from true profile and cross section.
3. Moisture Content: Add water to provide a uniformly distributed moisture to obtain the required compaction.
4. Compacting: Thoroughly compact each lift to a minimum of 95% Compact each area with at least four passes of compacting equipment. After compacting, screed smooth.
5. Grading: When surface areas have been rolled and it becomes necessary to add a thin layer of material to bring the surface to grade, the previously rolled or compacted area shall be raked to provide a bond with the added material.
6. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost to the Owner.
7. All areas of stabilized stone dust paving shall be sloped to maintain positive drainage off of the pavement surface.

3.04 PROTECTION

- A. Protect the paving against traffic, injury or defacement, or damage and subsequent construction operations until Final Acceptance.

END OF SECTION

SECTION 32 16 10
GRANITE CURB

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.01 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Granite curbs, vertically set.

1.02 SUBMITTALS

- A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this section including but not limited to the following items:
 - 1. Granite Curb.

1.03 QUALITY ASSURANCE

- A. Unless otherwise indicated, granite curb materials and construction shall conform to the applicable portions of the following:
 - 1. MassDOT Specification Section 500, "Curb and Edging".
- B. Curb Layout: After staking and laying out the curb work, and before beginning curb installation, obtain the Owner's representative's approval of layout. Contractor shall make minor adjustments as determined by the Owner's representative.
- C. Suitability of Subbase: The Contractor and his Subcontractors shall inspect all subbases for unstable, unsuitable or improperly prepared areas. Do not begin work over unacceptable areas. Beginning work means the Contractor and his Subcontractors accept the subbase, previous work and conditions and shall be

held responsible for any corrections required to properly implement the Construction Documents.

- D. Suitability of Existing Granite Curb: The Contractor, his Subcontractors, the Landscape Architect and the Owner's Representative shall inspect existing granite curbs for suitability for resetting. Broken, chipped, or otherwise damaged curbs shall be replaced with new granite curb unless otherwise directed by the Landscape Architect and the Owner's Representative.

1.04 PROJECT CONDITIONS

- A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
- B. The Contractor shall remove all debris, construction equipment and waste material from areas within the limit of work prior to inspection for acceptance.
- C. The Drawings indicate, in general, the alignment and finished grade elevations. The Owner's representative, however, may make minor adjustments in grades and alignment as are found necessary.
- D. Salvage Existing Curb: Maximum reuse shall be made in the new work of existing granite curbing which is removed and stockpiled. Additional granite curbing shall be provided by the Contractor. Coordination and use of additional granite curbing to be responsibility of the Contractor. Existing curb to be reused shall be reset in accordance with the requirements of this Section.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and supplies to the job adequately protected from damage during transit.
- B. Store products and supplies off the ground with wood cribbing between each unit. Curb shall be protected against staining, chipping, and other damage. Cracked, badly chipped, or stained units will be rejected and shall not be employed in the work.

PART 2 – PRODUCTS

2.01 GRANITE CURBING

- A. Granite shall be a structural granite conforming to ASTM C 615, Class I Engineering Grade, suitable for curbstone use.

1. Curb shall be light grey, free from seams which impair structural integrity, and with percentage of wear less than 32%, as determined by ASTM C 131.

- B. Curb materials shall conform to MHD Specifications Section M9.04.0 and shall meet requirements specified in the following subsection of Division III, Materials of the MHD Specifications:

Item	Section	Type
Granite Curb	M9.04.1	VA4
Granite Curb Inlets	M9.04.5	
Granite Curb Corners	M9.04.6	

2.02 CEMENT MORTAR

- A. Mortar for pointing joints between curbstones shall be a cement mortar composed of one part Portland cement and two parts sand, by volume with sufficient water to form a workable, stiff mixture.

2.03 CONCRETE

- A. Concrete for foundation at granite curb shall conform to MassDOT Specifications Section M4.00.0, 4000 psi, 1-1/2 in., 565 (Class A).

PART 3 – EXECUTION

3.01 SETTING CURB

- A. Set curb in accordance with MassDOT Specifications Section 501 and approved Shop Drawings.
- B. Set curb with continuous concrete setting bed.
- C. Vertical face of vertical curb shall be plumb, with curb top parallel to adjacent surface.
- D. Set curb accurately to line and grade. Fit curb units together as closely as possible. Do not field cut curbs.
- E. Joints between curb units shall be carefully filled with a cement mortar, and neatly pointed on the top and front exposed portions. After pointing excess mortar shall be cleaned from curb surface.
- F. Backfill material on each side of curb shall be as specified for adjacent surface and shall be thoroughly compacted by means of power tampers. Extreme care shall be taken not to destroy alignment. Curb sections disturbed during backfilling or otherwise shall be reset to line and grade, and properly backfilled.

END OF SECTION

SECTION 32 18 23
INFIELD MIX

PART 1- GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other parts of Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of this section, as indicated. Such work includes, but is not limited to the following:
 - 1. Furnishing and installing infield mix from off site sources as required to complete this section.
 - 2. Furnishing and installing fortification at batter's boxes mounds/pitchers circles
 - 3. Furnishing and installing all line whiting for all fields.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Chain Link Backstop
- B. Athletic Equipment
- C. Athletic Fields

1.04 SUBMITTALS

- A. Submit manufacturer's product data for each type of material and/or equipment required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.
- B. Store and handle manufactured products to prevent damage and deterioration.

1.06 PROJECT CONDITIONS

- A. General: The Contractor shall visit and accept the site as he finds it, and shall inform himself of the character and the type of site. The Contractor shall walk the site with the Landscape Architect prior to commencing work to determine the full scope of work.
- B. Damage or loss to site improvements shall be at the risk of the Contractor from and after the date of Contract execution, and no such damage or loss shall relieve the Contractor from any obligation under the Contract.
- C. Do not begin equipment work before completion of final grading and surfacing.

PART 2- PRODUCTS

2.01 SAND CHOKER LAYER

- A. Sand choker layer shall be meet the following criteria:

<u>Sieve Designation</u>	<u>% Passing by Weight</u>	
	Minimum	Maximum
No. 4	95	100
No. 8	80	100
No. 16	50	85
No. 30	25	60
No. 50	10	30
No. 100	2	10
No. 200	0	3

2.02 INFIELD MIX

- A. Skinned infield should be equivalent to Dura Edge Classic Infield mix as supplied by Read Custom Soils, 125 Turnpike Street, Canton, Massachusetts 02021 and shall meet the following general requirements.
 - 1. Density: 2,700 lbs. per cubic yard
 - 2. Mechanical Analysis: Sand - 74%; Silt - 12%; Clay - 16%
 - 3. Med-coarse sand (0.25mm-1.0mm) greater than or equal to 50%
 - 4. Silt to clay ratio: 0.5 – 1.0

2.02 CALCINED CLAY

- A. Calcined Clay for skinned infield surface treatment shall be equivalent to Turface Pro League Heritage Red as manufactured by PROFILE Products LLC, Buffalo Grove, IL

60089.

2.03 FORTIFICATION

- A. Clay for construction and fortification batter's boxes, pitcher's mound at the field and in the bullpens shall be equivalent to Hilltopper Mound Clay as manufactured by Stabilizer Solutions, Phoenix, Arizona 85034 (602)225-5900, stabilizersolutions.com or approved equal.
- B.
 - 1. Blend of natural clay and polymer that does not require water to activate
 - 2. Clay and polymer shall be blended prior to arrival on site
 - 3. Polymer shall be moist and tacky to remain playable for 6 months after installation without the addition of water.

2.04 LINE MARKING

- A. Whiting shall be a fine dry white powder prepared from natural chalk or oolitic calcium carbonate, and shall be free from grit or deleterious impurities.
- B. Whiting shall show the correct microscopical characteristics of the kind required and shall comply with the following requirements.

	Minimum	Maximum
Calcium Carbonate CaCo3	95.0%	-----
Fe O and A1 O	-----	1.0%
Water Soluble Matter	-----	0.5%
Matter Insoluble in Dilute Hc1	-----	4.0%
Passing 100 Mesh Sieve	100.0%	-----
Retained on 200 Mesh Sieve	-----	1.0%
Retained on 325 Mesh Sieve	-----	6.0%

PART 3 - EXECUTION

3.01 INSPECTION

- A. Obtain the written approval of the Landscape Architect for subgrade prior to spreading of the infield mix. By spreading the infield mix prior to receiving the written approval of the Landscape Architect, the Contractor assumes acceptance of the subgrade condition and the responsibility to repair deficiencies resulting from incorrect grades at his sole cost.

3.02 PREPARATION

- A. Remove loose material and debris from base surface before installing/compacting the existing base material and sand layer per the project details and the infield mix as outlined below.
- B. Locate and layout all infield areas for baseball field, including the pitcher's mound, batter's box areas, as well as all field markings. Obtain Landscape Architect's

acceptance of layout prior to installation.

3.03 INSTALLATION

- A. Sand Choker Layer shall be installed at a 3" depth, on top of compacted subgrade.
- B. Infield mix material shall be installed to a finished depth of four (4) inches minimum. During installation, no more than 2" of material should be added at one time. Each 2" "lift" of material shall be compacted with a three (3) ton roller. The material should be rough graded with a dual laser-guided blade each time after rolling to insure consistent depth of installation. Final grading shall be performed with a dual laser-guided blade and roll as required.
- C. Place clay fortification for baseball field as follows:
 - 1. Batters boxes and pitcher's mound, to 6" depth min. in areas shown on drawings per supplier's instruction. Cover with ½" minimum infield mix.
- C. Once the infield installation is inspected and approved, surface the infield area with Turface Heritage with manufacturer's installation recommendations at a rate of not less than two (2) ton for the infield.

3.04 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from installation.

3.05 INSTALLATION - LINE MARKING

- A. Lines marked skinned area for field shall be carefully laid out and marked on the surface with specified whiting using a line marking machine.

END OF SECTION

SECTION 32 18 24
ATHLETIC FIELDS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SCOPE OF WORK

- A. It is the intent of this specification to provide a high quality amended-in-place native topsoil athletic field consisting of the existing site topsoil and high quality washed screened sand.
- B. Refer to the Drawings for the extent and details of this work.
- C. The work of this Section consists of an amended native topsoil athletic field construction and related work as shown on the Drawings or required herein and includes, but is not limited to the following:
 - 1. Stripping the existing sod/thatch layer (assume 1" thick layer)
 - 2. Stripping and stockpiling topsoil from the existing field to be re-spread as required to complete work for this Section.
 - 3. Subgrade protection and preparation
 - 4. Spreading, compacting and laser grading of all rootzone materials for athletic field construction.
 - 5. Providing all soil amendments if required per the Material Testing.
 - 6. Installation of perimeter drainage (refer to Storm Drainage Specification)
 - 7. Installation of irrigation system
 - 8. Sodding of prepared athletic field surface including turfgrass maintenance and guarantee

1.03 RELATED WORK

- A. Site Preparation
- B. Erosion and Sediment Control
- C. Earthwork

D. Storm Drainage

E. Irrigation

1.04 SUBMITTALS TO BE INCLUDED WITH BID

A. Provide Proof of Experience Criteria as outlined in QUALITY ASSURANCE below. Contractor shall provide project name, project start and completion date, contact name, address and telephone number for each project to enable such data to be validated prior to the Contract Award.

1.05 SUBMITTALS TO BE PROVIDED DURING THE PROJECT

- A. All Material Testing Requirements and Results (refer to Material Testing section of this specification)
- B. Fertilizer recommendation for the approved rootzone and product information on all soil additives for approval.
- C. Compaction Testing Results
- D. 30' survey of finished subgrade for approval prior to spreading of rootzone.
- E. 15' survey of finished grades for approval prior to sodding operations.
- F. Sod grass seed mix and name of supplier for approval. Provide date of initial seeding, date and time of harvest and location in supplier's nursery.
- G. Certified bag tags for all seed used.
- H. Sand to be incorporated into rootzone.
- I. Product information on field construction and laser controlled hydraulically operated grading system and equipment.
- J. Submit a maintenance plan based on the final soil composition including the recommended timing for the first year. Maintenance plan shall include, but may not be limited to:
 - 1. Fertilization
 - 2. Core Aeration
 - 3. Deep Tine Aeration

1.06 MATERIAL TESTING (SUBMITTALS TO BE PROVIDED DURING THE PROJECT)

A. Testing of the subgrade materials (for compaction testing), drainage layers, and rootzone shall be performed and evaluated in accordance with the current standards of the Association of Official Agriculture Chemists and American Society of Testing and Materials (ASTM) Test Methods described in these specifications for putting green and sports turf root zones by an Approved Soil Testing Laboratory with A2LA Accreditation in these procedures.

1. The cost of all testing shall be borne by the Contractor. The Owner does reserve the right to perform their own testing of all materials.
2. All testing reports and recommendations shall be submitted to the Owner's Representative for review prior to use of materials, amending, or spreading of materials.
3. Approved Soil Testing Laboratories shall be used consistently throughout the project. Approved labs include:

Turf and Soil Diagnostics
35 King Street
Trumansburg, NY 14886
(855) 769-4231

- B. General Sampling Requirements: The Owner's Representative or Approved Representative must be present during the sampling and packaging of proposed rootzone.

1. Sampling of Construction Materials in Stockpiles
 - a. Sand, soil, root zone mixes, or gravel in stockpiles shall be taken in several locations within the stockpile. The outer 6 inches of the pile should be pulled back and a sampling tube (PVC is adequate) inserted into the pile. Withdraw the sample and place it in a large container, such as a 5 gallon pail. A minimum of 6 samples should be removed from different sections and levels in the pile. Once all of the samples are taken, the composite sample should be spread on a tarp, mixed thoroughly, and split in half. Discard half. Split the remaining material in half, and discard half again. Continue doing this until you have a one gallon sized sample. Repeat this procedure to obtain the necessary amount of sample material required by the testing laboratory.
 - b. Peat samples for organic matter quality should be a randomly selected bale. Bulk peat samples should be taken as described for sands and root zones.
2. Sampling of In-Situ Materials
 - a. Use a soil corer to procure random samples across the required project area at a rate of 10 samples per acre. Combine and mix the samples, and pull a representative sample for testing.
3. The material sample(s) shall be appropriately labeled and sealed in plastic bags or containers and shall be packaged and sent to an Approved Soil Testing Laboratory. A copy of each transmittal and a corresponding split sample shall be delivered to the Owner's Representative.
4. The Contractor shall provide adequate time in the schedule to account for the sampling, testing and Owner's Representative's subsequent review of all materials prior to delivery of amendments, blending and spreading operations. Failure of the Contractor to provide materials in a timely manner which meet the specification will not constitute a reason for additional costs or changes to the schedule.

- C. Topsoil Testing and Analysis:

1. The Contractor shall submit to the Approved Soil Testing Laboratory with A2LA Accreditation a five-gallon sample (confirm quantity with the testing laboratory) for each 500 cubic yards of:
 - a. Imported Rootzone
 - b. A copy of each transmittal and corresponding split sample shall be delivered to the Owner's Representative.
 2. The testing laboratory shall provide the following:
 - a. Particle Size Analysis (ASTM F1632, D422, D4972) to determine percentage of sand/silt/clay; sand size distribution; pH; sand particle shape; coefficient of uniformity; gradation index; and D85.
 - b. Organic Matter Analysis (ASTM F1647, method A)
 - c. Proctor Testing per ASTM D698 or D1557
 - d. Infiltration Rate per ASTM F1815
 - e. Fertility Analysis for the first approved sample. All chemical tests shall be performed in accordance to *Recommended Chemical Soil Test Procedures for the Project Region*.
 3. Based on the test results, the testing laboratory shall provide recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular agricultural, horticultural, or sportsturf management objectives noted.
- D. Washed Screened Sand Testing and Analysis:
1. The Contractor shall submit to an Approved Soil Testing Laboratory a one gallon (confirm required amount with testing laboratory) sample from each 500 cubic yard lot of the washed screened sand he intends to bring onto the site to amend the existing topsoil. A copy of each transmittal and corresponding split sample shall be delivered to the Owner's Representative.
 2. All reports shall be submitted to the Owner's Representative for approval prior to mixing with the onsite topsoil. Samples of each corresponding 500 cubic yard lot of washed screened sand to be brought to the site to amend the existing topsoil must be approved by the Owner's Representative prior to delivery.
- E. Sod Substrate Testing and Analysis:
1. The Contractor shall have the soil on which the proposed sod is grown tested for particle size prior to harvesting to ensure compatibility of the sod with the topsoil. The soil samples must be taken from within the area of the sod that will be harvested.
- F. Compaction Testing
1. Provide compaction test results (ASTM D698) for the subgrade following rough grading procedures and the spread rootzone following fine grading procedures for approval by the Owner's Representative. Testing shall be conducted and paid for by the Contractor by a testing agency approved by the Owner's Representative.

- a. Obtain appropriate Proctor Test results as described above for the subsoil and the rootzone.
- b. Complete 1 compaction test for every 10,000 sf of area within the field limits on the subsoil and on the rootzone layer. Final locations of testing shall be determined by the Owner's Representative.

1.07 QUALITY ASSURANCE

- A. Experience: Athletic field construction shall be performed by an experienced specialty firm which shall have constructed at least 5 natural grass athletic fields of 60,000 s.f. or greater of the general type and installation process herein specified within the last 8-year period. All experience must have been from one company (either general contractor or the sub-contractor). Combining work to meet the experience criteria will not be allowed.
- B. It is preferred (but not required) that one (1) (or more) member(s) of the General Contractor's team be an American Sports Builders Association (ASBA) Certified Sports Field Builder (CSFB). If applicable, provide proof of CSFB certification with the bid.
- C. All sod shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.
- D. Work under this Section shall be completed by skilled workers who are completely familiar with the specific requirements and methods needed for the proper completion of the work of this Section.

1.08 PRODUCT HANDLING

- A. Delivery and storage:
 1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Owner's Representative's review.
 2. Immediately remove from the site all materials which are not true to name, and all materials which do not comply with the specified requirements.
 3. Use all means necessary to protect materials before, during and after installation, and to protect the work and materials of all other trades.
 4. Contamination: Immediately remove from the site all materials that have been contaminated. In the case of contamination of stockpiled items, confer with the Owner's Representative and if directed remove entire stockpile from site immediately at no cost to the Owner.
 5. Repair and Replacement: in the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

1.09 JOB CONDITIONS

- A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade

stakes set by others until removal is mutually agreed upon by all parties concerned.

- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner's Representative before spreading rootzone layer.

PART 2 - PRODUCTS

2.01 FIELD CONSTRUCTION EQUIPMENT

A. Tractors and other Vehicles:

1. All vehicles trafficking within the athletic field areas shall be Low Ground Pressure (8 lbs/sq. inch maximum) machines designed to minimize compaction of the athletic field subgrade and surface and used specifically for natural grass athletic field construction.
2. Use of alternative machinery not meeting these specifications must be submitted, reviewed and approved by the Owner's Representative.

B. Laser Grader:

1. The final topsoil surface shall be graded to the specified tolerances with a machine meeting the following requirements:
 - a. Remote laser controlled, via the use of a GPS positioning survey system, hydraulically operated dual slope grading apparatus with self correcting blade not exceeding 6 feet in width and dual angle sensors adequate to calculate the cross-slope of the blade.
 - b. The tolerance of the machine shall be able to grade to +/- 1/8" accuracy with processed material.
 - c. Maximum machine weight of 3300 lbs
 - d. Maximum ground tire compression of 550 lbs per tire

2.02 AMENDED TOPSOIL (If needed per Topsoil Testing Recommendations)

- A. The Contractor shall amend the existing topsoil in place with washed screened sand. All additional material that is required to meet the proposed grades shall be washed screened sand.

1. WASHED SCREENED SAND
 - a. Washed Screened Sand shall conform to the following particle size distribution when tested for mechanical gradation (sieve analysis) and compared to the USDA Soil Classification System with a three eighths inch (3/8") largest dimension.

	Sieve Mesh	Diameter of sieve (mm)	Percent Finer
Coarse Gravel	5	4.00	100%
Fine Gravel	10	2.00	90-100%

Very Coarse Sand combined w/ gravel	18	1.00	80-100%
Coarse Sand	35	0.50	50-80%
Medium Sand	60	0.25	60-80%
Fine Sand	100	0.15	20% maximum
Very Fine Sand	270	0.05	5% maximum
Silt		0.002	3% maximum
Clay		<0.002	2% maximum

- b. In addition, there should be no more than 10% combined very fine sand, silt, and clay.

2.03 ROOTZONE MIX

- A. The root zone mixture will consist of the existing native topsoil, incorporated sand, and if needed, a processed peat or compost. The root zone mix will be evaluated using the ASTM Test Methods for putting green root zones and USGA recommendations in Green section Recommendation for a method of putting green construction by the Approved Soil Testing Laboratory.
- B. For bidding purposes, the contractor shall plan on supplying a final rootzone mix being made up of 63-67% sand, <25% silt, <9% Clay, and 4-8% organic matter, by volume for the bottom 6" layer of rootzone. For bidding purposes, Contractor shall assume 2" sand shall be incorporated into the native rootzone.
- C. The sand mix shall conform to the following particle size distribution as determined by ASTM F1632 and compared to the USDA Soil Classification System with a three eighths (3/8") largest dimension.

	<u>Sieve Mesh</u>	<u>Diameter of sieve (mm)</u>	<u>Allowable range % retained by weight</u>
Coarse Gravel	5	4.00	0%
Fine Gravel	10	2.00	0-3%
Very Coarse Sand	18	1.00	0-10% combined w/ gravel
Coarse Sand	35	0.50	at least 60%
Medium Sand	60	0.25	in this range
Fine Sand	100	0.15	20% maximum
Very Fine Sand	270	0.05	5% maximum
Silt		0.002	5% maximum
Clay		≤0.002	3% maximum

The mix shall have a coefficient of uniformity (D60/D10) of between 2.5 to 4.0.

1. Topsoil used for blending shall be as USDA Classified sandy loam with a minimum of 60% sand by weight, free of weeds and deleterious materials.

2. Organic Matter

- a. Compost shall be a biosolid compost meeting the following requirements:

An organic matter content of no less than 40% as determined by ASTM D2974.

A moisture content of 35 – 70%, as determined by ASTM D2974.

A carbon/nitrogen ratio of 15:1 to 30:1.

Soluble salts not to exceed 6 mS.

A Solvita Index of 6 to 8.

95 – 100% passing a 3/8" screen.

A pH of 6 to 8.

Non-phytotoxic.

It must meet EPA and state guidelines for land application.

- D. Upon approval of the sand, soil, and organic sources, the Approved Soil Testing Laboratory shall blend the components as they deem most appropriate and then define the ratio of the sand, peat or compost, and topsoil used to create the root zone mix. The ratio of sand, topsoil, and peat or compost shall be based on laboratory testing and performance criteria defined in these specifications.

The test results on the approved root zone mix will establish the specifications for approval or rejection of all subsequent quality control submittals during construction.

Root zone mix shall meet the following criteria when evaluated using ASTM 1815-97 Test Methods for putting green and sports turf root zones. Water retention shall be done at 25 cm tension. Tests shall determine compliance with specified mixing ratio and provide calibration data for the quality control program. Test shall be performed by an Approved Soil Testing Laboratory and comply with the following criteria on a core compacted at 14.3 ft-lbs/square inch.

Saturated hydraulic conductivity (inches per hour)	6 to 12 i.p.h.
Bulk density (gm/cc)	1.3 to 1.65 gm/cc
Total Porosity (percent)	35-55%
Aeration porosity	15-30%*
Capillary porosity	15-30%*
Saturation percentage	40-55%
Organic matter content**	1 to 4% on a dry weight basis
pH	6.0-7.5

*Aeration and Capillary porosity shall not vary by more than 8%

**The organic matter content will be determined by Method 1 of ASTM F-1647.

2.04 LIME

- A. Lime shall be an approved agricultural limestone containing no less than fifty (50%) percent of total carbonates and twenty five (25%) percent total magnesium with a neutralizing value of at least one hundred (100%) percent. The

material shall be ground to such a fineness that forty (40%) percent will pass through a Number 100 U.S. Standard Sieve, and ninety eight (98%) percent will pass through a Number 20 U.S. Standard Sieve. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use will be rejected.

1. For the purpose of bidding, Contractors shall assume the incorporation of lime to a depth of four inches (4") at a rate of one hundred fifty pounds of lime per one thousand square feet of rootzone (150 lbs/1000 s.f.).

2.05 FERTILIZER

- A. Fertilizer shall be spread by a Certified Applicator and under the supervision of the Owner's Representative.
- B. The fertilizer type shall be dependent upon the testing results of the topsoil.
 1. For the purpose of bidding, the Contractor shall assume:
 - a. Spread a commercial turfgrass slow release starter fertilizer at a rate of 1lb/sf organic and 1.5lb/sf coated synthetic nitrogen on the topsoil prior to seed.
- C. The Contractor shall supply fertilizer to be spread on the topsoil prior to sod.
 1. Following completion of sod, the Contractor shall apply one (1) application of fertilizer to the surface as recommended by sod manufacturer.

2.06 SUPERPHOSPHATE

- A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than twenty (20%) percent available phosphoric acid. The superphosphate shall be delivered to the original, unopened containers, each bearing the manufacturer's guaranteed analysis and submitted to the Owner's Representative for approval. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use will be rejected.
 1. For the purposes of bidding assume no Superphosphate is required.

2.07 WATER

- A. Water is available in the form of the underground irrigation system network fed from the Owner's water system. Water shall be provided and paid for by the Owner so long as it is not used wastefully.
- B. Owner provided water shall not be utilized for anything other than this project and shall not be used for purposes unrelated to the construction of the field.

- C. Water for settling the installed amended topsoil rootzone, establishing and irrigating the proposed field will be in the form of the existing upgraded irrigation system installed as part of this Project. In the event that the Contractor fails to properly install the irrigation system prior to sodding or for settlement of the rootzone, water shall be provided in the form of hoses and/or a temporary irrigation system provided at no additional cost to the Owner.
- D. In the event that damage is done to the water source as a result of Contractor operations or negligence, the Contractor shall provide adequate water from offsite sources to establish and maintain the athletic field seed and/or sod and adjacent areas and vegetation affected by the interruption until acceptable repairs are made to the system.

2.08 HERBICIDES, PESTICIDES AND FUNGICIDES

- A. Herbicides, fungicides, and other pesticides may be used subject to the approval of the Owner's Representative, and handled by State Licensed operators only.

2.09 ATHLETIC FIELD SOD

- A. The sod shall be a crop at least one but not more than two years old (from date of seeding) grown on mineral soil, and shall be 100% Kentucky Bluegrass and a blend of at least three Kentucky bluegrass cultivars in approximately equal proportions. At least 70% of the sod blend shall be at least two of the following varieties: Able I, Aspen, Banff, Blacksburg, Challenger, Classic, Eclipse, Estate, Midnight, Princeton (P-104), Ram I, Touchdown, or Trenton. Any variety substitutions or deviations from these specifications must be approved by the Owner's Representative.
 - 1. Annual Bluegrass, or Poa Annua, found in the field shall not be accepted. If found, the Contractor will be responsible for removing the Poa Annua and ensuring the grass has not spread to other parts of the field area. If within a 10'x10' area greater than 20% is comprised of Poa Annua, that entire area must be removed and replaced.
- B. Sod shall be grown on a sandy loam or loamy sand substrate that is compatible with the amended topsoil. Loams, silt/loams and clayey soil substrates will not be accepted.
- C. The sod shall be as grown by Tuckahoe Turf Farms, Inc., Berwick, ME, (800)-556-6985, Kingston Turf Farms, Inc. Kingston, RI, (401) 789-0630, Winding Brook Turf Farm, Wethersfield, CT (800) 243- 0232 or other approved source.
- D. Notwithstanding the above, sod supplied from these growers must meet the sod substrate specifications and be compatible with the amended topsoil athletic field.
- E. Sod shall be machine cut at a uniform soil thickness of three quarters (3/4") inch, plus or minus one quarter (1/4") inch, by a minimum of thirty (30) inches wide at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Broken pads and torn or uneven ends will not be acceptable.

- F. Sod shall be stored in rolls with the grass top side inverted so that the topsoil is to the exterior.

PART 3 – EXECUTION

3.01 TOPSOIL / SOD BED PREPARATION

- A. Scarify the subgrade and incorporate the topsoil material. Remove stones over 1/2", sticks and rubbish. Move no heavy objects over athletic field area after preparing subgrade surface.
- B. Grading shall be done with a machine as specified above to a tolerance of 1/8 inch in 10 feet in either direction plus or minus of elevations shown on the drawings when compacted. Any contamination or over compacted topsoil conditions will require immediate action by the Contractor to satisfy the intent of the specifications. Contractor shall power rake as needed and then laser grade to have a pliable material suitable for finish grade.
- C. Install the irrigation system and test to ensure it is in proper working condition. If the system is not working properly, the Contractor must contact the Owner's Representative immediately for resolution.
- D. Compaction of topsoil: Operate the irrigation system one full cycle or until water is known to have fully saturated the topsoil profile. Confirm that the existing grade slopes without settlement or pockets promoting the collection of water. Fill in low spots to finish grade with topsoil as appropriate and water in thoroughly. The process shall be repeated as necessary to bring the field to finish grade within the tolerances described. If a light roller is used to obtain field grade, the surface shall be scarified before sodding.
- E. Finish grades shall be verified by survey instruments with the Contractor providing a true laser level topographical field survey on a 15 foot grid.
 - 1. Notify Owner's Representative 48 hours prior to final laser grade pass for approval of grades. (Approval shall be for grade tolerance only.)
 - 2. Provide the survey to the Owner's Representative for review. Obtain the written approval of the Owner's Representative for finish grade of athletic field surfaces prior to sodding operations. By sodding prior to receiving the written approval of the Owner's Representative, the Contractor assumes acceptance of the finish grade condition and the responsibility to repair deficiencies resulting from incorrect grades at his sole cost.
- F. Provide field compaction testing. Field compaction shall not exceed 87% of maximum compaction on the topsoil as performed in laboratory testing.
- G. Material should be spread with tracked equipment. No trucks should be driven on placed rootzone at any time. Materials shall be installed in a moist condition.
- H. Pre- Sod Soil Amendments

1. Soil pH: Spread ground limestone as recommended by soil testing laboratory evenly over the athletic field surface. Do not exceed one hundred fifty (150) pounds of lime per one thousand (1,000) square feet.
2. Prior to sodding, apply a commercial turfgrass starter fertilizer.

3.02 FERTILIZING

- A. Contractor to have the rootzone tested for soil fertility by an Approved Soil Testing Laboratory, and a complete fertilization program will be recommended by the testing laboratory for the installation maintenance period and be reviewed and approved by the Owner.
- B. Continue with application of recommended fertilization program until all turf areas are in acceptable condition and are approved in writing by the Owner's Representative.
- C. The cost of the fertilization program shall be borne by the Contractor until final acceptance by the Owner's Representative.

3.03 ATHLETIC FIELD SODDING

- A. Sod may be placed from April 15th to November 1st as long as the ground is not frozen.
- B. Sod shall be harvested, delivered and transplanted within a period of twenty four (24) hours. Soil on sod pads shall be kept moist at all times.
- C. Immediately prior to sodding operations, the sod bed shall be lightly scratched with a fine toothed harrow or hand rake to provide a slightly roughened surface to accept the sodding application.
- D. The sod bed shall be reasonably moist and shall be watered, if necessary. The sod shall be laid smoothly, edge to edge with a maximum joint tolerance of 1/16". Sodding shall be laid perpendicular to the soccer field end lines and progressing across the field in continuous parallel rows. Vertical joints between sod rolls shall be staggered a minimum of 5'.
- E. Sod shall be watered during and immediately after installation to prevent drying. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad, and amended topsoil immediately below the pad, are thoroughly wet.
- F. After sodding, the field shall be rolled with an approved lawn roller weighing not more than 65 pounds per foot of width.

3.04 TURF MAINTENANCE AND INSPECTION

- A. Maintenance of the athletic field turfgrass shall begin immediately after seeding operations, and generally consist of watering, weeding, mowing and edging, fertilization, aerification, reseeding and removal of poorly established areas,

disease and insect pest control, repair of all erosion, and any other procedure consistent with good horticultural practice, necessary to insure normal, vigorous and healthy turfgrass growth.

- B. Maintenance shall also include all temporary protection fences, barriers, signs and all other work incidental to proper maintenance.
- C. The Contractor shall be responsible for maintenance to establish a uniform stand of the approved grasses until acceptance. After sod has been laid, all areas and parts of areas shall be re-seeded, repeatedly, until all areas are covered with a satisfactory growth of grass. The field will not be accepted if patchy areas are not repaired and growing uniform with the rest of the grass.
- D. Contractor is responsible for weed prevention and removal during the maintenance period. The final accepted field shall be weed free.
- E. At the time of the first cutting, mow turf not less than two (2") inches high with sharp reel type mowing units. Turf shall be maintained at two inches (2") high. Do not remove more than one third (1/3) of the grass blade during a mowing which should result in no visible clippings left after a mowing.
 - 1. The athletic field will not be considered acceptable, and the Contractor's maintenance responsibilities will continue, until the entire athletic field exhibits uniform, healthy and vigorous turfgrass growth. A minimum of ten (10) mowings must be completed before final acceptance.
 - 2. The machine used to mow the field shall have a deck no larger than 72" and utilize low ground pressure tires to minimize compaction at the field.
- F. Watering: The Contractor shall utilize the proposed irrigation system for watering. However, in the case that the irrigation system is not available due to Contractor operations, the Contractor shall provide at his cost daily, and if necessary continuous watering of all grass areas during a normal 8 hour working day. The growing medium shall be maintained in a continuous moist condition, satisfactory for good germination and growth of grass, as specified until acceptance. The Contractor is responsible for providing all equipment, hoses, etc. for watering throughout the project and until final acceptance of athletic field turf by the Owner's Representative.
- G. Provide one (1) deep tine (VertiDrain) aerification and two (2) conventional core aerations at the discretion of the Owner's Representative during the turf establishment and maintenance period.
- H. Full and complete written records for the maintenance of the athletic fields are to be furnished to the Owner, by the Contractor at least ten (10) days prior to the end of the contractual maintenance period, to familiarize him with the maintenance requirements for proper care and development of the turfgrass.

3.05 INSPECTION AND ACCEPTANCE

- A. The Owner's Representative shall inspect the athletic field turf for acceptance upon written request by the Contractor. The request shall be received at least ten (10) days before the anticipated date of inspection.

- B. Final acceptance will not be granted until all sodded areas are in satisfactory condition.
- C. If the turfgrass is in satisfactory condition, the Contractor's care and maintenance responsibilities will end. If the grass stand is unsatisfactory, the Contractor's maintenance responsibilities shall continue until an acceptable stand of grass is achieved. The Contractor shall fertilize the turf and/or treat pests if, in the Owner's Representative's opinion, it is needed in order to achieve an acceptable athletic field.

3.06 CLEAN UP

- A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner's Representative, at no cost to the Owner.

END OF SECTION

SECTION 32 30 00
SITE IMPROVEMENTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Extent of site improvements are shown on the drawings and details.
- B. Work under this section shall include, but not be limited to the following:
 - 1. Bike Rack
 - 2. Picnic Table (regular & ADA)
 - 3. Park Bench
 - 4. Trash/Recycling Receptacles
 - 5. Portable Toilet Shade Structure
 - 6. Sheds
 - 7. Flagpole
 - 8. Detectable Warning Plate

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. Commonwealth of Massachusetts, Department of Public Works: "Standard Specifications for Highways and Bridges," referred to herein as the Standard Specifications or SSHB.
 - 2. ASTM (American Society of Testing and Materials) Grade 60, new deformed billet steel reinforcing bars conforming to the requirements of ASTM Specification A615.
 - 3. ASTM (American Society of Testing and Materials) Standard Specification for Epoxy Coated Reinforcing Bars, ASTM Specification A 775.

1.04 QUALITY ASSURANCE

- A. Installations shall be performed by experienced installers.

1.05 SUBMITTALS

- A. Submit manufacturer's product data for all materials required.
- B. Shop Drawings: For the following, submit complete shop drawings, showing plan, sections, elevations, and details illustrating all material composition and sizes, accessories, and methods of installation.
1. Bike Rack
 2. Picnic Table (regular & ADA)
 3. Park Bench
 4. Trash/Recycling Receptacles
 5. Portable Toilet Shade Structure
 6. Sheds
 7. Flagpole
 8. Detectable Warning Plate

PART 2 - PRODUCTS

2.01 BIKE RACK

- A. The bike racks shall be "Bike Hitch" by Dero, 504 Malcolm Ave SE, Suite 100, Minneapolis, MN 55414, or approved equivalent product. Center beam shall be 2" schedule 40 pipe (2.375" OD) and the ring shall be 1.5" OD, 11 gauge tube with an outside diameter of 16.5". Finish shall be hot dip galvanized. All attachment hardware shall be hot dip galvanized.
- B. Color: Powder Coated Black
- C. Mounting Option: surface mount

2.02 PICNIC TABLES (REGULAR AND ADA)

- A. Picnic tables shall be 72 Series recycled plastic picnic tables, as manufactured by Dumor, Inc. P.O. Box 142, Mifflintown, PA 17059 1-800-598-4018 www.dumor.com, or Landscape Architect/Owner approved equal. Picnic tables shall consist of:
1. Standard Picnic Table: Length shall be 6'-0"
 2. ADA Picnic Table
 3. Refer to plans for quantity and location.

- B. Picnic tables to be surface mounted with concrete anchor bolts. Hardware to be painted black after installation.
- C. Color:
 - 1. Steel members to be black
 - 2. Recycled Plastic members to shall be selected by owner from manufacturers standard colors.

2.03 PARK BENCH

- A. The park bench shall be 6' long, with cast iron end frames and recycled plastic seat planks. Bench shall be surface mounted and shall be Model 57-60PL as manufactured by Dumor, Inc. P.O. Box 142, Mifflintown, PA 17059 1-800-598-4018 www.dumor.com , or Landscape Architect/Owner approved equal.
- B. Color shall be selected by Owner from standard manufacturer colors.
- C. Quantity: Two (2)

2.04 TRASH/RECYCLING RECEPTACLE

- A. Trash/recycling receptacle shall be steel slats that is able to accept half of the bin as trash and half of the bin as recycling. Receptacle shall be Model 107-40 RC as manufactured by Dumor, Inc. P.O. Box 142, Mifflintown, PA 17059 1-800-598-4018 www.dumor.com , or Landscape Architect/Owner approved equal.

2.05 PORTABLE TOILET SHADE STRUCTURE

- A. The shade structures shall be 'Gable Roof Rectangle' shelters by Polygon, 4240 136th Ave., Holland, MI 49424, polygon.com, or approved equal.
- B. Size of shade structure shall be as shown on the Drawings.
- C. Structure Color: colors to be chosen from Manufacturer's standard color options.
- D. Footings: To be constructed in accordance with manufacturer instructions.
- E. Wood cladding slats installed as show on the drawings.
 - 1. Boards shall be Eastern white cedar, No. 1 grade or better. Sound, thoroughly seasoned, surfaced four sides (S4S), well manufactured and free from warp.
 - 2. Moisture content: maximum of 19 percent.
 - 3. Thickness: as shown on the Drawings.

4. All exposed surfaces shall be free of lumber stamps or other markings.
5. All fasteners exposed to weather shall be stainless steel.

2.06 SHEDS

A. Provide Storage Sheds that shall be equivalent to the basis of design to the "Cape Ann" model as manufactured by Post Woodworking or the product submitted shall meet or exceed the following characteristics:

1. 8'x8' for the utility shed (irrigation and lighting control)
2. 12'x12' for the storage shed
3. Timber frame
4. Hardie plank clapboard
5. PVC trim
6. Standard dark grey roof shingles
7. Extended eaves
8. Double doors
9. No windows
10. $\frac{3}{4}$ " plywood floor
11. Placed on CMU blocks

2.07 FLAG POLE

- A. Flagpole shall be aluminum fabricated from seamless extruded tubing complying with ASTM B241, alloy 6063-T6, having a minimum wall thickness of .188" tensile strength of not less than 30,000 psi. Heat treated and age-harden after fabrication. Height as shown on the drawings and powder coated black.
- B. Provide a flagpole where shown on drawings for a complete and proper installation. Provide flagpole as a complete unit produced by a single manufacturer, including all fittings and accessories. Halyard to be internal type system.
- C. Construct pole and ship to site in one piece. Spiral wrap flagpole with heavy Kraft paper or other protective wrapping and ship in hard fiber tubes or other protective containers.

- D. Aluminum groundset internal halyard flagpole shall be set in aluminum tube 1" to 3" larger in diameter than the shaft.
- E. Fittings:
 - 1. Finial 14 gauge spun aluminum ball, powder coated black finish with flush seam sized to match butt diameter of shaft.
 - 2. Truck cast aluminum revolving, non fouling, with 26 stainless steel ball bearings and two cast nylon sheaves.
 - 3. Internal halyard, one set of #10 white waterproof polypropylene, equipped with two chrome swivel-snaps to secure the flag.
 - 4. Cleat One internally mounted cam-action cleat with integral sheave, factory mounted.
- F. Provide one American flag for flagpole. Size for flag shall be 6'x10'.
- G. Flagpole quantity: Refer to Drawings.
- H. Flagpole shall be manufactured by the following or equal:
 - 1. American Flagpole, 26252 Hilman Highway, P.O. Box 547, Abingdon, VA 24210, (703)628-4188.

2.08 DETECTABLE WARNING PLATE

- A. Detectable warning panels shall be 24" x 24", cast iron, with natural finish, wet set with integral lugs and cap head screws, as manufactured by Neenah Foundry, 2121 Brooks Avenue, Neenah, WI 54958, (800) 558-5075; EJ Group, Inc., 1125 Pearl Street, Brockton, MA 02301, (508) 586-3130; ADA Solutions, Inc., 323 Andover Street – Suite 3, Wilmington, MA 01887, (800) 372-0519; or approved equal.
- B. Detectable warning panels shall meet the requirements of MassDOT standard drawing E 107.6.5 Detectable Warning Panel for Wheelchair Ramps and Standard Ramp Terminology.
- C. Detectable warning surfaces shall be in compliance with Architectural Access Board regulations 521 CMR, and shall contrast visually with adjacent walking surfaces.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install and construct manufactured products specified in Part 2 of this section in strict compliance with manufacturer's specifications and recommendations unless otherwise specified herein.
- B. Protect, support and brace all site improvements as necessary during construction until ready for use.
- C. Do not begin installations and erection before the finish elevations have been established, unless otherwise permitted.

3.02 BIKE RACK

- A. Install bicycle rack level and plumb at the locations indicated on the Drawings and in accordance with approved shop drawings. Provide concrete footings for bicycle rack, as indicated. Coordinate bicycle rack installation with installation of the surrounding surface at grade beneath the bicycle rack.
- B. Protect bicycle rack from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper around the bicycle rack until adjacent work is completed. Repair any damage to finish in a manner consistent with manufacturer's recommendations.

3.03 PICNIC TABLE

- A. Picnic Tables shall be located as indicated on the Drawings and per manufacture's recommendations.

3.04 PARK BENCH

- A. Park benches shall be located as indicated on the Drawings and per manufacture's recommendations.

3.05 TRASH/RECYCLING RECEPTACLES

- A. Trash/recycling receptacles shall be located as indicated on the Drawings and per manufacture's recommendations. Each receptacle shall be fastened to the base with a minimum of four bolts.
- A. Receptacle shall be positioned in the required location and firmly secured to the base.

3.06 PORTABLE TOILET SHADE STRUCTURE

- A. Portable toilet shade structure shall be located as indicated on the Drawings and per manufacture's recommendations.

3.07 SHEDS

- A. Sheds shall be located as indicated on the Drawings and per manufacture's recommendations.
- 3.08 FLAGPOLE
 - A. Install pole in concrete footing in compliance with shop drawings and as recommended by the Manufacturer.
- 3.09 DETECTABLE WARNING PLATE
 - A. Detectable warning plate shall be located as indicated on the Drawings and per manufacture's recommendations.

END OF SECTION

SECTION 32 31 00
CHAIN LINK FENCE AND BACKSTOP

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. 6' Chain Link Fence
 - 2. 8' Chain Link Fence
 - 3. Chain Link Backstop

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Earthwork
- B. Cast-In-Place Concrete Curb

1.04 REFERENCES

- A. ASTM - American Society for Testing and Materials
- B. Commonwealth of Massachusetts Department of Transportation - Standard Specifications for Highways and Bridges (MassDOT Specifications)

1.05 LAWS, ORDINANCES, PERMITS AND FEES

- A. The Contractor shall:
 - 1. Give necessary notices, obtain all permits and pay all Governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals of the local Building Departments having jurisdiction.

2. Obtain all required certificates of inspection for this work and deliver same to the Owner's Representative before request for acceptance and final payment for the work.
3. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.

1.06 QUALITY ASSURANCE

- A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.
- B. Codes and Standards: Perform site improvements work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
- C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades which adjoin materials of this Section before installing items specified.

1.07 SUBMITTALS

- A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this Section including but not limited to the following:
 1. 6' Chain Link Fence
 2. 8' Chain Link Fence
 3. Chain Link Backstop
- B. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation. Work includes but is not limited to the following items:
 1. 6' Chain Link Fence
 2. 8' Chain Link Fence
 3. Chain Link Backstop
- C. Material Selection and Samples: Submit samples showing the complete range of colors, textures and finishes available for all components required for construction.

Work includes but is not limited to the following:

1. Provide a 12" x 12" sample of fence fabric.
2. Provide a 12" section of each type of fence or gate pipe required.
3. Provide a 6" sample of fabric tie material.

PART 2 - PRODUCTS

2.01 CHAIN LINK FENCE AND GATES

- A. The types of fencing required for the project are as indicated below, subject to detailed material requirements which follow.
- B. All material shall be new, and products of recognized reputable manufacturers. Used, re-rolled or re-galvanized materials are not acceptable.
- C. Like items of materials provided hereinafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.
- D. Fabric shall be premium grade helically wound and woven steel core wire in accordance with ASTM F668 Class 2B vinyl fabric. Color to be black.
- E. Material specifics shall be as follows:

	Core (inches)	Wire (gauge)	Zinc (oz/S.F.)	Mesh Size	
3'to12'Chain link fence 3/4"	0.192	6	.40		1

- F. Selvages: Fence fabric shall be knuckled selvage at top and bottom.
- G. Powdercoated framework shall be steel pipe - Type II: Cold formed and welded steel pipe complying with ASTM F 1043, Group IC, with minimum yield strength of 50,000 psi (344 MPa), sizes as indicated. Protective coating per ASTM F 1043, external coating Type B, zinc with organic overcoat, 0.9 oz/ft² (275 g/m²) minimum zinc coating with chromate conversion coating and verifiable polymer film. Internal coating Type B, minimum 0.9 oz/ft² (275 g/m²) zinc or Type D, zinc pigmented, 81% nominal coating, minimum 3 mils (0.08 mm) thick. Color to be black.
- H. Schedule of pipe sizes shall be as follows:

Application	Height in Feet	Out. Dim. in Inches	Weight lbs/foot
Terminal/ Corner Posts	6'-0" or less	2.375	3.12
	Over 6'-0"	4.00	6.56
Line Post	6'-0" or less	1.90	2.28
	Over 6'-0"	2.875	4.64

Rails and Braces	(all heights)	1.660	1.84
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- I. Posts shall be of sufficient length to allow for installation into concrete footings to a minimum depth of 3'-6" below finish grade.
1. Where integrated with athletic ball netting, posts shall be round.
- J. Post tops shall be provided with post caps which fit securely and exclude moisture.
- K. Top Rails shall have lengths not less than eighteen feet and shall be fitted with min. 6 inch long outside sleeved or internally swaged couplings for connecting the lengths into a continuous run. Provide top rail with pass-through fittings at line posts and rail end cups and brace bands at terminal or gate posts.
- L. Middle and Bottom Rails shall be secured to line posts with steel boulevard clamps, and to terminal, corner, gate or pull posts with rail end cups and brace bands.
- M. Brace Rails shall be provided for each terminal post with fabric height of six feet or more. Extend brace to each adjacent post at approximate mid-height of fabric and secure with rail end cups and brace bands. Provide diagonal truss bracing with 3/8 inch steel rod and turnbuckle.
- N. Fence fittings and accessories shall be fabricated of steel or cast iron and shall conform to minimum requirements of ASTM F-626, and as below. Following fabrication and galvanizing, all fence fittings shall receive a 10 to 14 mil thick fusion bonded vinyl coating to match fabric color. With the exception of field painting for nuts and bolts, no painted fittings will be accepted.
1. Stretcher Bars shall not be less than 3/16 by 3/4 inch and not less than 2 inches shorter than the nominal height of the fabric with which they are to be used. One stretcher bar shall be provided for each end and gate post, and two for each corner and pull post.
2. Fabric connectors shall be provided in sufficient number for attaching the fabric to all line posts at intervals not exceeding twelve inches (12"); and not exceeding twelve inches (12") when attaching fabric to top or bottom rail. Connectors shall be galvanized with a min. 0.8 oz s.f. coating of zinc.
3. Unless designated otherwise on the details, tie wires shall be fabricated from rolled 9 gauge wire stock which has been cut to required lengths for hand-twisted connections at the site.
4. Tension Bands shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding twelve inches (12"). Tension bands shall be formed from flat or beveled steel and shall have a minimum thickness after galvanizing of 0.078 inch; and minimum width of 3/4 inch for posts 4 inch O.D. or less; and 0.108 inch thickness by 7/8 inch for posts larger than 4 inch O.D. Brace bands shall be formed from flat or beveled steel and shall have a minimum thickness of 0.108 inch after

galvanizing; and a minimum width of 3/4 inch. Attachment bolts shall be 5/16 x 1-1/4 inch galvanized carriage bolts with nuts, ASTM A-307, Grade A.

5. Other hardware required shall be fabricated from steel, and galvanized in accordance with ASTM A123 and/or ASTM A153.

O. Chain Link Swing Gates:

1. Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized 1.90" steel tubular members weighing 2.28 lb/ft. Fusion or stainless steel welded connections forming rigid one-piece unit. Frames shall be thermally fused after fabrication with minimum 10 mils per ASTM 1043. Coating before fabrication will not be allowed. Gates over 8' high or 15' wide shall be provided with additional horizontal and vertical members to ensure proper strength.

2. Chain link fabric for gates shall match fabric of fencing.

3. Gate posts shall be steel pipe – type II finished to match fence posts:

<u>Gate leaf height</u>	<u>Post Size (inches)</u>	<u>Weight (lb/ft.)</u>
4 ft	2.875	5.79

4. Gate hinges shall be heavy-duty offset type. Install gate for 180-degree outward operation. Hinges shall have large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

5. All gates shall be equipped with a positive closure latch and padlock fitting.

6. Double gates shall be equipped with a drop rod to hold the inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of the latch, requiring one pad lock for locking both leaves.

- P. Poured-in-place concrete footings shall have a twenty-eight day compressive strength of 3,000 psi.

2.02 CHAIN LINK BACKSTOP

- A. The types of fencing required for the project are as indicated below, subject to detailed material requirements which follow.

- B. All material shall be new, and products of recognized reputable manufacturers. Color to be black. Used, re-rolled or re-galvanized materials are not acceptable.

- C. Like items of materials provided hereinafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.

- D. Fabric shall be premium grade helically wound and woven steel core wire in accordance with ASTM F668 Class 2B vinyl fabric, black.
- E. Material specifics shall be as follows:

	Core (inches)	Wire (gauge)	Zinc (oz/S.F.)	Mesh Size
Back and Sides	0.148	6	.40	1 3/4"

1. Selvages: Fence fabric shall be knuckled selvage at top and bottom.
- F. Framework shall be steel pipe - Type I: Cold formed and welded steel pipe complying with Group IA intermediate grade schedule 40 steel pipe, ASTM F 1083-06, with minimum yield strength of 50,000 psi (344 MPa), sizes as indicated. Protective coating per ASTM F 1043, external coating Type B, zinc with organic overcoat, 0.9 oz/ft² (275 g/m²) minimum zinc coating with chromate conversion coating and verifiable polymer film. Internal coating Type B, minimum 0.9 oz/ft² (275 g/m²) zinc or Type D, zinc pigmented, 81% nominal coating, minimum 3 mils (0.08 mm) thick. Color to be powder coated black.
1. Schedule of pipe sizes shall be as follows:
 - a. Corner, End and Line Posts: 6 5/8" o.d (168.3 mm), 18.97 lbs/ft.
 - b. Horizontal Rails: 1.9" o.d (48 mm), 2.72 lbs/ft.
 2. Posts shall be of sufficient length to allow for installation to a minimum depth of 4 ft. below finish grade.
 3. Post tops shall be provided with post caps which fit securely and exclude moisture.
- G. Top Rails shall have lengths not less than eighteen feet and shall be fitted with min. 6 inch long outside sleeved or internally swaged couplings for connecting the lengths into a continuous run. Provide top rail with pass-through fittings at line posts and rail end cups and brace bands at terminal or gate posts.
- H. Middle and Bottom Rails shall be secured to line posts with steel boulevard clamps, and to terminal, corner, gate or pull posts with rail end cups and brace bands.
- I. Brace Rails shall be provided for each terminal post with fabric height of six feet or more. Extend brace to each adjacent post at approximate mid-height of fabric and secure with rail end cups and brace bands. Provide diagonal truss bracing with 3/8 inch steel rod and turnbuckle.
- J. Fence fittings and accessories shall be fabricated of steel or cast iron and shall conform to minimum requirements of ASTM F-626, and as below. Following fabrication and galvanizing, all fence fittings shall receive a 10 to 14 mil thick fusion bonded vinyl coating to match fabric color. With the exception of field painting for nuts and bolts, no painted fittings will be accepted.

1. Stretcher Bars shall not be less than 3/16 by 3/4 inch and not less than 2 inches shorter than the nominal height of the fabric with which they are to be used. One stretcher bar shall be provided for each end and gate post, and two for each corner and pull post.
2. Fabric connectors shall be provided in sufficient number for attaching the fabric to all line posts at intervals not exceeding twelve inches (12"); and not exceeding twelve inches (12") when attaching fabric to top or bottom rail. Connectors shall be galvanized with a min. 0.8 oz s.f. coating of zinc.
3. Unless designated otherwise on the details, tie wires shall be fabricated from rolled 9 gauge wire stock which has been cut to required lengths for hand-twisted connections at the site.
4. Tension Bands shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding twelve inches (12"). Tension bands shall be formed from flat or beveled steel and shall have a minimum thickness after galvanizing of 0.078 inch; and minimum width of 3/4 inch for posts 4 inch O.D. or less; and 0.108 inch thickness by 7/8 inch for posts larger than 4 inch O.D. Brace bands shall be formed from flat or beveled steel and shall have a minimum thickness of 0.108 inch after galvanizing; and a minimum width of 3/4 inch. Attachment bolts shall be 5/16 x 1-1/4 inch galvanized carriage bolts with nuts, ASTM A-307, Grade A.
5. Other hardware required shall be fabricated from steel, and galvanized in accordance with ASTM A123 and/or ASTM A153.

PART 3 - EXECUTION

3.01 CHAIN LINK FENCE AND GATES

- A. General: Unless modified herein, installation of fencing shall meet the requirements of ASTM F567. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction.
- B. Post Holes: Post holes for line posts shall be excavated to a minimum size of fifteen inches by forty eight inches (15"x48"). For fences six feet (6') and taller post holes shall be excavated to a minimum size of eighteen inches by forty-eight inches (18" x 48"). Post holes for terminal or gate posts shall have a minimum diameter of eighteen inches (18"), by respective depths as specified.
 1. Backfill concrete to within 6 inches of finished grade and crown top to shed water.
 2. Set posts with plumb vertical alignment.
- C. For posts being installed in the turf anchor, the anchor shall be cored and the posts grouted into place. All grout material shall be filled even with the top of the anchor to shed water away from the posts. Prior to coring the post holes in the concrete

curb, the Contractor shall layout the fencing in the field to ensure proper spacing of the post holes.

- D. Space posts in the fence line equally with the maximum spacing shown on Drawings.
- E. Provide corner or pull posts at maximum intervals of 250 ft. O.C., and for any change in direction of 15 degrees or more, and for any abrupt change in grade, with bracing in both directions.
- F. Hanging Fabric:
 - 1. Fasten chain link fence fabric to terminal posts, and gate posts with tension bars and tension bar bands.
 - 2. Fasten chain link fence fabric on field side unless otherwise noted on plans.
 - 3. Fence fabric shall be secured to all rails and to posts that are not terminal, or gate with wire ties at specified spacing. Tie down wire shall be woven through the fence fabric, completely around the rail and wire shall be twisted securely with three twists on the rail side of the fence and the tails of the wire cut off to preclude untwisting by hand. Twisted tie wire ends shall be turned under at horizontal rails and turned down at vertical rails to reduce potential for human contact.
 - 4. Stretch fabric as tightly as possible without pulling the material out of shape. Top of fabric shall be parallel with top rail.
- G. Testing of Fence Fabric: Each fence panel shall be constructed such that it will pass the following test. Deflection of fence fabric shall be no greater than 2 inches when a force of 30 pounds is applied in the center of the panel, perpendicular to the plane of the fence fabric. Fabric shall return to original position when force is released.
- H. Gates, install gates in conformance with specification and detail requirements. Test swing and latch and adjust as necessary for proper operation.

3.02 CHAIN LINK BACKSTOP

- A. Layout the backstop with the middle posts set at right angles to, and equally spaced from, a line extending from the pitcher's mound through home plate, 8' apart on centers unless otherwise noted on the Drawings. End posts are set 8' on center from the corner posts and parallel with the sides of the diamond unless otherwise noted on the Drawings.
- B. Posts shall be 48" deep and integrated into the backstop wall as shown on drawings.
- C. Assemble, plumb and adjust the entire unit. (Check from all angles and from a 100' distance) Tighten all bolts and set screws securely.
- D. Attach fabric on field side so that fabric remains in tension after pulling force is

released. Corner hood sections are to be cut to shape. Sharp ends are to be turned back into the fabric after cutting and before attaching to frame. One tension bar is to be used on each side panel. The remaining edges are to be tied with tie wire every few inches to the top and bottom rails of the wing. Secure the fabric to the rails by two loops of the tie wire, every 15". Turn the ends of the ties up tight around the rails leaving no sharp ends exposed.

END OF SECTION

SECTION 32 40 00
ATHLETIC EQUIPMENT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this section.
- B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Work Included: Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Team Benches
 - 2. Baseball Bases, Pitchers Rubber, and Homeplate
 - 3. Foul Poles
 - 4. Storage Containers
 - 5. Batting Cage
 - 6. Fence Guards
 - 7. Portable Pitching Mound

1.03 RELATED WORK

- A. Earthwork
- B. Cement Concrete Paving

1.04 REFERENCES

- A. ASTM - American Society for Testing Materials

1.05 LAWS, ORDINANCES, PERMITS AND FEES

- A. The Contractor shall:
 - 1. Give necessary notices, obtain all permits and pay all Governmental taxes, fees and other costs in connection with this work, file all necessary plans, prepare documents and obtain all necessary approvals of the local Building Departments having jurisdiction.

2. Obtain all required certificates of inspection for this work and deliver same to the Landscape Architect before request for acceptance and final payment for the work.
3. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.

1.06 QUALITY ASSURANCE

- A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.
- B. Codes and standards: Perform site improvements work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
- C. Qualifications of workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades, which adjoin materials of this Section before installing items specified.

1.07 SUBMITTALS

- A. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation. Work includes but is not limited to the following items:
 1. Team Benches
 2. Baseball Bases, Pitchers Rubber, and Homeplate
 3. Foul Poles
 4. Storage Containers
 5. Batting Cage
 6. Fence Guards
 7. Portable Pitching Mound

PART 2 – PRODUCTS

2.01 TEAM BENCHES

- A. The Polyboard Two-Tier Bench shall be equivalent to the basis of design to model # PTBT10 as manufactured by Sportsfield Specialties, 41155 State Route 10, Delhi, NY (607) 746-1404 or approved equal.
 1. Bench Length and Quantity : Two (2) 10' benches at each team area, totaling 4 benches.

2. Color as selected by the Owner's Representative from manufacturer's full line of available colors.

2.02 BASEBALL BASES, PITCHER'S PLATE AND HOME PLATE

A. Bases shall be equivalent to the basis of design to the following:

1. 5" x 15" x 3", molded one-piece heavy rubber, universal aluminum stanchion that fits 1 ½" and 1" ground anchors, and be equivalent to 175-MLB-INV Major League Bolco Base as provided by Beacon Athletics, 8233 Forsythia St., Ste 120, Middleton, WI 53562-4231, (800) 747-5985.
2. Quantity: Three (3)

B. Pitcher's Rubbers shall be equivalent to the basis of design to the following:

1. Regulation 6" x 24" pitcher's rubber with double 1 ½" ground anchor, two (2) rubber plugs, digout tool, and be equivalent to TMK 10378 Deluxe Double Stanchion Pitcher's Rubber as provided by Beacon Athletics, 8233 Forsythia St., Ste 120, Middleton, WI 53562-4231, (800) 747-5985.
2. Quantity: One (1) for field, one (1) at bull pen. Total of 2.

C. Plates shall be equivalent to the basis of design to the following:

1. Regulation home plate, molded rubber on a stanchion mounted steel plate, to fit 1 ½" anchor, and be equivalent to HP Anchored Home Plate as provided by Beacon Athletics, 8233 Forsythia St., Ste 120, Middleton, WI 53562-4231, (800) 747-5985.
2. Anchors and rubber plugs for anchors to be provided.
3. Quantity: One (1) for field, one (1) at bull pen. Total of 2.

D. Base Anchors shall be equivalent to the basis of design to the following:

1. All steel, 1" Bolco-style stake anchor, and be equivalent to GSBM Standard Ground Anchor as provided by Beacon Athletics, 8233 Forsythia St., Ste 120, Middleton, WI 53562-4231, (800) 747-5985.
2. Quantity: Three (3) for field.

2.03 FOUL POLES

A. Provide foul pole 20' above finish grade height that shall be equivalent to the basis of design to model FPW420 Foul Pole With Wing as manufactured by Sportsfield Specialties, Delhi, NY, or the product submitted shall meet or exceed the following characteristics:

1. 3-1 /2 in. O.D. aluminum pipe visual steel mesh wing.
2. Color: Yellow.
3. Quantity : Two (2).

2.04 STORAGE CONTAINERS

- A. Storage containers at team areas shall be equivalent to the basis of design to the Husky Steel Job Site Tool Box 60"W x 24"D x 27.5"H as provided by Home Depot, (800) 466-3337, or the product submitted shall meet or exceed the following characteristics:
- B. All storage container shall be steel construction, have stainless steel lockable latches, and with piano hinges.
- C. All storage boxes shall be flushed mounted onto concrete slabs.
- D. Color: Black
- E. Quantity : One (1) at each team area. Total of 2.

2.05 BATTING CAGE

- A. Provide Batting Cage 13'H x 14'W x 65'L that shall be equivalent to the basis of design to the "Tension Batting Tunnel" model #BTBBS as manufactured by Sportsfield Specialties, Inc., PO Box 231, 41155 State Highway 10, Delhi, NY 13753 (607-746-1460) or the product submitted shall meet or exceed the following characteristics:
 - 1. Upright Poles: 8" Schedule 40 Steel (8.625" O.D.) Pipe
 - 2. 4' Direct Embedment
 - 3. Extension Arms: 3/8" Steel Plate x 18" Long
 - 4. Crossbar Supports: 4" x 3/16" wall Square Steel Tube
 - 5. Black Powder Coated Finish
 - 6. Tension Cable Support: 1/4" 7x19 Black Powder Coated Galvanized Aircraft Cable with 1/2" x 6" Jaw and Jaw Turnbuckles
 - 7. Standard #36 Black Nylon Net, 1-3/4" Square Mesh with Rope Bound Perimeter
 - 8. 4'W x Full Height Overlapped Entryways
 - 9. Black Vinyl Encased 1/4" Galvanized Chain Ground Weight

2.06 FENCE GUARDS

- A. Fence Guard shall be equivalent to the basis of design from Chain Link Safety "Top Cap" as manufactured by PDS Fence Products, Athol, MA 01331, (800) 755-7528, or the product submitted shall meet or exceed the following characteristics:
 - 1. Premium grade – 3" wide x 4 1/2" high x 8' long with a wall thickness of .09", constructed of heavy duty, UV-resistant polyethylene secured with ties.
 - 2. Color to be yellow at outfield fence. Color shall be black at foul line fence.

2.07 PORTABLE PITCHING MOUND

- A. The portable pitching mound shall be equivalent to the basis of design to model #Pitch Pro 796 6 inch Portable Game Mound as manufactured by Beacon

Athletics, 8233 Forsythia St STE 120, Middleton, WI (800) 747-5985
www.beaconathletics.com or approved equal.

1. Quantity : One (1).

PART 3 – EXECUTION

3.01 GENERAL

- A. General: Installation/materials for all items in this section shall meet the applicable requirements of the:

1. National Federation of State High School Associations
PO BOX 690
Indianapolis, IN 46206
(317)972-6900

3.02 TEAM BENCHES

- A. Install per manufacturer's recommendations and drawings.
- B. Team benches shall be surface mounted to concrete pad at Team Areas.

3.03 BASEBALL BASES, PITCHERS RUBBER, AND HOMEPLATE

- A. Install in accordance with manufacturer's recommendations and approved Shop Drawings.

3.04 FOUL POLES

- A. Install in accordance with manufacturer's recommendations and approved Shop Drawings.

3.05 STORAGE CONTAINERS

- A. Install in accordance with manufacturer's recommendations and approved Shop Drawings.
- B. Storage containers shall be surface mounted to concrete pad at Team Areas.

3.06 BATTING CAGE

- A. Install in accordance with manufacturer's recommendations and approved Shop Drawings.

3.07 FENCE GUARDS

- A. Install in accordance with design drawings, manufacturer's recommendations and approved Shop Drawings.
- B. Fence Guard shall have cut outs at line post at chain link fencing as shown on the

design

3.08 PORTABLE PITCHING MOUND

- A. Install in accordance with design drawings, manufacturer's recommendations and approved Shop Drawings.

END OF SECTION

SECTION 32 84 00
IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Section 010000 requirements, apply to this section.
- B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective drawings pertaining to other work.
- C. Carefully examine all of the Contract Documents for requirements that affect the Work of this section.
- D. Particular attention is directed to the following Sections / Divisions that affect the Work of this section.
 - 1. Division 2 – Exterior Improvements
 - 2. Division 16 - Electrical

1.02 WORK TO BE DONE

- A. The work under this section consists of furnishing and installing all labor, materials, equipment and services required to complete and provide a fully operational, automatic athletic and manual quick coupler irrigation system as per the scope depicted on the irrigation drawings and as per the final approved landscape plans.
- B. The work shall include irrigation of all natural turf athletic field surfaces and installation of manual quick coupling valves as shown on the irrigation drawings.
- C. The mechanical point of connection for the irrigation system shall be a new connection/tap of the existing domestic water mainline located in Drake Road. A new 2-inch pipe shall be installed from Drake Road to the new utility building in the park. See Civil Drawings and Specifications for water connection information.
- D. Work of this section includes installation of a new 2-inch water meter and 2-inch backflow preventer, interior to the new park utility building. The irrigation water supply shall provide a minimum of 70-psi dynamic pressure at a maximum flow rate of 60 gallons per minute, downstream of the new 2-inch reduced pressure zone backflow preventer, also located interior to the water service room. Contractor shall verify dynamic pressure and report any deviation to the Owner's Representative before continuing.
- E. New automatic irrigation controller shall be installed in new park utility building (See Electrical) as depicted on the drawings and as directed by the Owner's Representative. The irrigation controller will require a dedicated 120-volt, 10-amp

circuit. 120-volt power shall be hard wired to the controller. A 2-inch Schedule 40 conduit shall be routed from controller to a landscaped area for the 24-volt controller wires. A 1-1/2-inch Schedule 40 conduit shall be routed from controller to a landscaped area for the grounding grid. All above ground wire shall be installed in conduit including ground and power wiring.

- F. Trench excavation, backfilling and bedding materials, together with the testing and proper scheduling of the completed installation shall be included as part of this scope of Work.
- G. The Work shall be constructed and finished in every respect in a good, workman-like and substantial manner, to the full intent and meaning of the specifications. All parts necessary for the proper and complete execution of the Work, whether the same may have been specifically mentioned or not, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.
- H. Record Drawing as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this Work.
- I. The irrigation system described within these performance specifications represents a single controller athletic irrigation system supplied from potable water supply. The system is designed for a maximum flow of 60 gallons per minute maximum and 60 pounds per square inch minimum dynamic pressure at the base of the rotary sprinklers.
- J. The irrigation system to be installed shall conform to up-to-date design standards and common practices of the irrigation industry, as pre-approved prior to installation by the Owner's Representative

1.03 PERMITS AND INSPECTIONS

- A. The Work under this section shall comply with all ordinances and regulations of authorities having jurisdiction.
- B. Obtain and pay for all permits required for the execution of Work under this section.
- C. Furnish copies of Permits and Approval Notices to the Owner's Representative before requesting final payment.

1.04 SUBMITTALS

- A. General: Submit each item in this section according to the Conditions of the Contract and Division 1.
- B. Provide Owner's Representative copies of product specification sheets for proposed equipment to be installed to ensure product installation is consistent with performance specification. Work on the irrigation system may not commence until product sheets are submitted. Equipment to be included:

- 1. Sprinklers

2. Valves: Manual and Automatic
3. Controller and Enclosure
4. Valve Boxes
5. Pipe and Fittings
6. Wire and Connectors
7. Quick Coupling Valves
8. Rain Shut Off
9. Water Meter
10. Backflow Preventer
11. Miscellaneous Materials

C. Project record documents:

1. Provide and keep up-to-date a complete redlined Record Set of Drawings of the system as the project proceeds. Drawings shall be corrected daily, showing every change from the original Drawings and Specifications. Final record drawings shall specify and exactly locate, sprinkler locations and type including pop up height and nozzle for each sprinkler installed. Each valve box location shall be located and referenced by distance from a minimum of two permanent locations. Controller, rain sensor, flushing valves, quick coupling valves and all other equipment shall be indicated on the drawings. All wire routing, wire size and splices shall be indicated. Main line pipe and wire route shall have two (2) distinctly different graphic symbols (line types). Prints for this purpose may be obtained from Owner's Representative at cost. This redlined record set of drawings shall be kept at job site and shall be used only as a record set.
2. This redlined set of documents shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. This record set of drawings shall be available at all times for observation and shall be kept in a location designated by Owner's Representative. Should this record set of drawings not be available for review or not be up-to-date at the time of the observation, it will be assumed no work has been completed. Provide copies of the redlined record set of drawings for Owner's Representative review on a monthly basis.
3. Make neat and legible notations on this record set of drawings daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions and northing and

easting coordinates should then be transferred to the appropriate drawing in this record set of drawings at the proper time.

4. On or before the date of final field observation, deliver corrected and completed AutoCAD "record drawings" in digital format (.dwg file) and PDF digital copies to Owner's Representative as part of contract closeout. Delivery of files will not relieve the responsibility of furnishing required information that may have been omitted from the prints. AutoCAD record drawings shall be provided in Massachusetts State Plane coordinate system.

1.05 QUALITY ASSURANCE

- A. Installer: A firm which has at least five (5) years experience in work of the type (conventional) and size (commercial) required by this section and which is acceptable to the Owner's Representative.
- B. References: The Contractor must supply three references for work of this type and size with their bid including names and phone numbers of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
 1. American Society for Testing & Materials (ASTM)
 2. National Standard Plumbing Code (NSPC)
 3. National Electric Code (NEC)
 4. National Sanitary Foundation (NSF)
 5. American Society of Agricultural and Biological Engineers (ASABE)
 6. Underwriters Laboratories, Inc. (UL)
 7. Occupational Safety and Health Administration (OSHA)
 8. American Society of Irrigation Consultants (ASIC)

1.06 TESTS

- A. Pressure: Field verify dynamic pressure before commencement of work. Any deviation from calculated requirements shall be reported to the Owner's Representative before start of work.
- B. Observation: The Owner's Representative will be on site to insure the system has been installed according to the specifications and drawings.
- C. Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers and drip tubing as directed by the Owner's Representative. Demonstrate to the Owner's Representative that all irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies

of coverage due to deviations from the drawings or where the system is obviously inadequate or inappropriate. (See Part 3 - Execution).

- D. The Owner's Representative shall be notified 7 days in advance for observations.
- E. During final observation, two-way communication and sufficient personnel to provide instantaneous communication between the observation area and the controller for the system shall be provided.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage.

1.08 GUARANTEE

- A. Obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees, warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.
- C. As part of the one-year warranty, perform the first year-end winterization and spring start-up for the irrigation system.
- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

1.09 COORDINATION

- A. At all times coordinate work closely with the Owner's Representative and other construction disciplines to avoid misunderstandings and to efficiently bring the project to completion. The Owner's Representative shall be notified as to the start of work, progression, and completion, as well as any changes to the drawings before the change is made.
- B. Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work, as directed by the Owner's Representative.

1.10 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Included in the bid shall be an allowance for four (4) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust opera-

tions by a competent operator (the Owner's Representative's office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).

- B. Upon completion of work and prior to application for acceptance and final payment, a minimum of one (1) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE HURD FIELD IRRIGATION SYSTEM, shall be submitted to the Owner's Representative's office in addition to a digital copy of the entire manual in PDF format. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
1. Table of Contents
 2. Written description of Irrigation System.
 3. System drawings:
 - a. One (1) hard copy of the approved irrigation plan;
 - b. One (1) hard copy of the Record Drawing;
 - c. One (1) hard copy of the controller valve system wiring diagram
 4. A complete set of "APPROVED" submittals of all irrigation equipment;
 5. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
 6. One (1) copy of the controller/valve/rain shut off system wiring diagram.

1.11 EXAMINATION OF CONDITIONS

- A. Contractor shall fully inform themselves of existing conditions on the site before submitting their bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.
- B. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Owner's Representative.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material overages at the completion of the installation shall be removed from the site.

- B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

2.02 BRASS PIPE AND FITTINGS

- A. Brass pipe shall be 125lb., cast bronze, ground joint pattern, threaded, ASTM B43-98.
- B. Brass fittings shall be cast bronze, screwed, 125lb. Class.

2.03 COPPER PIPE AND FITTINGS

- A. Copper pipe shall be Type K, hard tempered ASTM B88.
- B. Copper fitting shall be wrought copper, solder joint type in accordance with ASTM B828-00.
- C. Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.
- D. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

2.04 PVC IRRIGATION PIPE AND FITTINGS

- A. All pipes shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. All pipe in sizes 2-1/2 inches and smaller shall be PVC, Type 1120, SDR21, Class 200, solvent-weld, conforming to ASTM No. D-1785 as manufactured by Certainteed, Cresline, JM Eagle or equal.
- C. All pipe in size 3 inches shall be PVC, Class 200, Type 1120, SDR 21, Gasket-Joint PVC, conforming to ASTM No. D-2241 as manufactured by Certainteed, Carson, JM Eagle or equal.
- D. The pipe insertion mark shall be visible to show the proper depth into spigot.
- E. Pipes shall be minimum 3 inches for flows 81-120 gpm, 2-1/2 inches for flows 55-80 gpm, 2 inches for flows 30-54 gpm, 1-1/2 inch for flows 22-29gpm, 1-1/4 inch for flows 14-21 gpm and 1 inch carrying flows less than 13 gpm.
- F. Fittings for solvent weld PVC pipe shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or equal.
- G. Fittings for 3-inch PVC pipe for all directional changes, pipe reductions shall be deep bell push-on gasket joint ductile iron fittings for PVC pipe. Fittings shall be manufactured of ductile iron, grade 70-55-05 in accord with ASTM A536 and gaskets shall meet ASTM F477. Fittings shall be as manufactured by Harrington Corporation, Harco, or equal. For main line pipe to zone valve / lateral pipe connec-

tions, Harco or equal push-on gasket joint ductile iron service tees shall be used. Saddles, (strap, bolt down or snap) will not be approved for installation.

- H. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.
- I. All PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads will not be approved for installation.
- J. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Clear Primer for PVC and CPVC, or equal.
- K. All nipples to be schedule 80 PVC.

2.05 POLYETHYLENE PIPE

- A. Lateral pipe 1-1/4 inch and smaller may be installed with polyethylene (PE3408) pipe, SDR 15, Class 100, Type III, Grade 3, Class C conforming to ASTM D2239, with a minimum pressure rating of 100 psi as manufactured by Oil Creek or equal. Polyethylene pipe shall only be used in landscape areas.

2.06 POLYETHYLENE FITTINGS

- A. Fittings for polyethylene pipe shall be insert PVC or Nylon type fittings. Fittings shall conform to NSF standards and be attached with two (2) dog-eared stainless steel clamps. Clamps shall be as manufactured by Oetiker or approved equal.
- B. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage. Fittings shall be per ASTM D2609 as manufactured by Dura, Lasco or Spears.

2.07 PVC SLEEVES

- A. All pipe sleeves beneath non-soil areas shall be minimum PVC, Class 160 water pipe as manufactured by Certainteed, Cresline, JM Eagle or equal. Minimum sleeve size to be 3-inch.
- B. Sleeves shall be minimum 2 sizes larger than the total nominal outside diameter of all the piping contained within the sleeve.

2.08 WIRE CONDUIT

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Carlon, Cresline, JMM or equal. Minimum below ground sleeving shall be 2-inch in size.

- B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
- C. Conduit for above ground wiring to rain shut off or controller shall be galvanized, rigid metallic conduit.

2.09 SPRAY SPRINKLERS

- A. Full and part circle pop up spray sprinklers shall be pressure regulating (30-psi), plastic construction with ratcheting riser, removable nozzle and check valve. Nozzle size shall be indicated on the drawing and in the legend. Pop-up height shall be 4 inches for turf, 12 inches for landscape beds. Nozzles shall be fixed arc. VAN nozzles shall be used only where a fixed nozzle is not available for that arc.
- B. Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Rain Bird, model 1804-SAM-PRS or equal.

2.10 SMALL/MEDIUM ROTARY SPRINKLERS

- A. Small/medium rotary sprinklers shall be gear-driven, rotary type heads, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 25-44 foot radius and flow range of 0.9-7.0 gpm at 50-55 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for two years minimum against defects in workmanship.
- B. The nozzle assembly shall elevate minimum four inches when in operation and retraction shall be achieved by a stainless steel spring. Riser assembly shall be plastic. A nozzle wiper seal shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material.
- C. All sprinkler parts shall be removable through the top of the unit through the removal of a heavy-duty threaded cap. The sprinkler shall have a three quarter-inch (3/4") IPS water connection on the bottom of the sprinkler.
- D. Sprinklers shall be manufactured by, Rain Bird model 5004-PL-SAM, Hunter Industries model I20-04 or approved equal.
- E. Approved Performance Chart (18' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I20-04	50psi	90 Deg.	.50SR	0.50	18'
Hunter I20-04	50psi	180 Deg.	1.0SR	1.0	18'
Hunter I20-04	50psi	360 Deg.	2.0SR	2.0	18'

- F. Approved Performance Chart (25' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
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Rain Bird 5004-PL-SAM	45psi	90 Deg.	MPR 25Q	1.00	26'
Rain Bird 5004-PL-SAM	45psi	180 Deg.	MPR 25H	1.98	27'
Rain Bird 5004-PL-SAM	45psi	360 Deg.	MPR 25F	3.82	31'
Hunter I20-04	50psi	90 Deg.	.75SR	0.75	25'
Hunter I20-04	50psi	180 Deg.	1.5SR	1.5	25'
Hunter I20-04	50psi	360 Deg.	3.0SR	3.0	25'

G. Approved Performance Chart (35' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 5004-PL-SAM	55psi	90 Deg.	1.5	1.71	35'
Rain Bird 5004-PL-SAM	55psi	180 Deg.	3.0	3.47	40'
Rain Bird 5004-PL-SAM	55psi	360 Deg.	6.0	6.63	47'
Hunter I20-ADV	50psi	90 Deg.	2.0	2.0	38'
Hunter I20-ADV	50psi	180 Deg.	4.0	4.2	41'
Hunter I20-36V	50psi	360 Deg.	8.0	6.8	44'

2.11 LARGE ROTARY SPRINKLERS

- A. Large rotary sprinklers shall be gear-driven, rotary type with drain check valve and stainless steel riser designed for in-ground installation. The nozzle assembly shall elevate three inches when in operation and retraction shall be achieved by a stainless steel spring. Check valve shall be capable of holding up to 10 feet of elevation. Sprinkler shall be capable of covering a 49-61 foot radius and flow range of 7.5 to 15.7 gpm at 60 pounds per square inch of pressure.
- B. Sprinkler parts shall be removable through the top of the unit by removing a heavy-duty threaded cap. The sprinkler shall have a one- inch (1") IPS water connection on the bottom of the sprinkler.
- C. Sprinklers shall be manufactured by Hunter Industries model I25-04-SS, Rain Bird model 8005-SS or approved equal.

D. Approved Performance Chart (45' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 8005-SS	60psi	90 Deg.	6	6.1	45'
Rain Bird 8005-SS	60psi	180/360 Deg.	8	8.4	49'
Hunter I25-04-SS	60psi	90 Deg.	5	5.3	45'
Hunter I25-04-SS	60psi	180/360 Deg.	8	9.2	50'

E. Approved Performance Chart (50' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 8005-SS	60psi	90 Deg.	6	6.1	45'
Rain Bird 8005-SS	60psi	180/360 Deg.	10	10.1	53'
Hunter I25-04-SS	60psi	90 Deg.	7	7.5	48'
Hunter I25-04-SS	60psi	180/360 Deg.	13	12.3	54'

F. Approved Performance Chart (55' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Rain Bird 8005-SS	60psi	90 Deg.	8	8.4	49'
Rain Bird 8005-SS	60psi	180/360 Deg.	12	12.0	59'
Hunter I25-04-SS	60psi	90 Deg.	8	9.2	50'
Hunter I25-04-SS	60psi	180/360 Deg.	18	15.7	59'

2.12 ELECTRIC CONTROL VALVES

- A. Electric control valves shall be remote control diaphragm type, pressure regulating glass-filled nylon body valves with flow control and a minimum 200 psi pressure rating. Valve shall have globe or globe/angle configuration, 24-volt a.c. electric.

- B. Valves with flow from 0 to 25 gpm shall be 1 inch.
- C. Valves with flow from 26 to 40 gpm shall be 1.5 inch.
- D. Valves with flow from 41 to 50 gpm shall be 2-inch.
- E. Maximum zone size shall be 50 gpm.
- F. Valves shall be manufactured by Rain Bird model PEB with PRS-Dial, Hunter Industries, model ICV with AS-ADJ or equal.

2.13 QUICK COUPLING VALVES

- A. The valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under all conditions when the key is not inserted.
- B. The top of the valve body receiving the key shall be equipped with ACME threads and smooth face to allow the key to open and close the valve slowly. The quick coupling valve shall be equipped with a vinyl cover.
- C. The valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.
- D. Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.
- E. Contractor shall provide minimum two (2) keys for quick couplers and two (2) 1-inch x 3/4-inch swivel hose ells
- F. Quick coupling valves, keys and swivels shall be manufactured by Toro models 100-ATLVC, 100-AK and 075-MHS, Hunter Industries, model HQ-44RC-AW, HK-44A and HS-1 or approved equal.

2.14 VALVE BOXES

- A. All valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. All boxes shall be green or black in color.
- B. Valve boxes for single electric valves, isolation valves and quick coupling valves shall be 10-inch round valve boxes with t-top lids, metal detection and bolt down covers.
- C. Valve boxes for dual 1 inch and 1-1/2 inch and single 2 inch electric valves shall be 12-inch standard valve boxes with t-top lids, metal detection and bolt down covers.
- D. Valve boxes for traveler connections shall be 18 inch jumbo valve boxes with t-top lids, metal detection and bolt down covers.

- E. Valve boxes for wire splices shall be 10-inch round valve boxes with t-top lids, metal detection and bolt down covers. All splices shall be in separate valve boxes and not included with isolation valves. Covers shall be gray in color.
- F. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer as the box.
- G. Valve boxes shall be manufactured by Highline Products, Old Castle Specification Grade or NDS Pro Series.

2.15 AUTOMATIC CONTROLLER

- A. Controller shall be electronic in construction with capability of up to 10 hour run times per zone in increments of 1 or 10 minutes. Controllers to have minimum four independent programs, each program having up to 8 start times per day. Controller shall have auto/off switch and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, cycle and soak feature, sensor input terminal, flow sensing, locking, weather resistant cabinet and internal transformer. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120 volt, 60 Hertz, A.C. type.
- B. The controllers shall be compatible with a central control system platform using GPRS/cellular communication cartridges. Controller shall be provided with a cellular communication cartridge/modem.
- C. Controller shall be as manufactured by Rain Bird model ESP-LXMe , Baseline 3200, Hunter ACC2 or approved equal.
- D. Expansion modules shall be added to expand station count to 42 zones.

2.16 FLOW SENSOR

- A. An irrigation main line flow sensor shall be provided and installed in accordance with drawings at irrigation point of water service. Refer to drawings and/or details for location. Contractor shall be responsible for installation, hook-ups, materials, components, and connection of flow sensors for complete automatic operation of the system.
- B. The flow sensor shall be as manufactured by Rain Bird, model FS150P or approved equal, sized 1.5-inch and be compatible with installed irrigation controller. Install as recommended by manufacturer and as indicated on drawings and specifications herein placed in a rectangular valve box or interior to utility building.

2.17 CONTROLLER SURGE ARRESTOR

- A. The modular surge arrester shall be a single phase, two pole arrester designed to protect single or split phase 120 volt or 120/240 volt electrical systems. Electrical connections shall be embedded in a UL recognized epoxy to seal and protect them from moisture and corrosion.

- B. The surge arrestor shall be molded from weather and UV resistant polycarbonate, complying with the UL Standard for flame and strength resistance.
- C. Surge Arrestor shall be manufactured by Intermatic model, AG2401C, Rainbird model LSP-1, Hunter Industries ICD-XXX decoder with surge suppression with ground wire, or approved equal.
- D. Manufacturer's names and/or model numbers identified herein are intended to assist in establishing a general level of quality, configuration, functionality, and appearance required. This is NOT a proprietary specification and it should be noted that "Or equal" applies to all products denoted herein. It is understood that all manufactures will have minor variations in configuration, appearance, and product specifications and such minor variations shall not eliminate such manufacturers as an equal". It is the intent of this specification to encourage open and competitive involvement from multiple manufacturers that are able to supply similar products.

2.18 RAIN SENSOR

- A. Rain sensor shall be polycarbonate in construction with adjustable interruption point and metal extension arm.
- B. Rain sensor shall carry a five (5) year warranty.
- C. Rain sensor shall be manufactured by Hunter Industries, model Rain-Clik, Rain Bird RSD, Toro TRS or approved equal.

2.19 CONTROLLER LIGHTNING PROTECTION AND GROUNDING

- A. All controllers shall include factory-installed and factory-recommended lightning protection and shall be connected to a grid pattern of 5/8 inch diameter x 10 foot long copper clad grounding rods with minimum #6 AWG, solid, insulated copper wire and 4 inch x 96 inch x 0.0625 inch copper grounding plates as outlined below. Minimum 20 foot separation between rods and plates in each grid. All connections to rods shall be with Cadweld connectors as specified. All connections to plates shall be performed by the plate manufacturer (Paige #182199) with 25 feet of insulated copper wire already attached. Each grounding rod is to be covered by a 4 inch round, grated top, plastic valve cover with metal detection and six inches of 4 inch ADS or equal drainage pipe. Plates shall be installed in ground enhancement material. Plates shall be covered with 4 inch plastic grated cover with detection and minimum 36 inches of 4 inch drainage pipe. Ground rods and plates shall be UL listed or manufactured to National Electric Code requirements for "made" electrodes.
- B. Each controller location shall be grounded to one rod and one plate. 10-foot rod shall be installed to its full length within 20 feet of the controller, but no less than 8 feet. Plate shall be installed at a 36-inch depth with 50 lbs of PowerSet ground enhancement material spread evenly below the plate and 50 lbs spread evenly above the plate in accordance with manufacturer's requirements. The grounding electrodes shall be installed at least 8 feet from the wires connected to the controllers.

- C. All controllers shall be equipped with an Intermatic AG2401 or equal surge arrestors on the incoming 120-volt power.

2.20 WIRE

- A. All valve control wire shall be minimum #14-awg, common #14-awg, single strand, solid copper, UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Individual wires must be used for each zone valve. Common wire shall be white in color, control wire for spray zones shall be red in color, bubbler zones control wire shall be orange and spare wires, installed where indicated on the drawings shall be blue. White color shall be used for common wire only.
- B. In ground wire connections shall be UL listed, manufactured by 3M, model DBR/Y-6, Rain Bird model DBTWC25 splice kits. All wire splices shall be made in valve boxes, at controller, or at valves.
- C. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.
- D. All wiring shall be in strict accordance with all national, state and local electrical codes.

2.21 ISOLATION VALVES

- A. Isolation valves 2-1/2 inches and smaller in size shall be gate type, of bronze construction, US Manufacture, 200 WOG with steel cross handle and 200 psi rating. Gate valves to be as manufactured by Nibco, model T-113-K or approved equal.
- B. Isolation valves 3 inch in size shall be cast iron epoxy coated inside and outside, long bell length ringtite valves, 200 psi rated, ductile iron gland flange, bronze stem-seal box, O-ring stem seal replaceable under pressure, stainless steel stem, 2-inch operating nut and replaceable disc conforming to AWWA C-509 as manufactured by Nibco, Model P-619-RW or approved equal.

2.22 CURB STOP AND STOP AND WASTE VALVES

- A. Curb stop and stop and waste valves shall be provided and installed on water service line to shut off and drain water service to park. Valves shall be made of brass, rated for a minimum of 300 psi.
- B. All brass that comes in contact with water shall conform to AWWA Standard C800. Valve shall be lead-free and provide lead free identification.
- C. Valve tee-head shall be solid, one piece.
- D. Valve seats shall be EPDM rubber or approved equal.
- E. Valve connections shall be by female iron pipe thread or compression.
- F. Stop and waste valve shall isolate incoming water service when valve is actuated, and simultaneously open a drain port, relieving all water pressure on the downstream side of the valve.

- G. Valves shall be as manufactured by Mueller, The Ford Meter Box Company, Inc. or approved equal. Curb stop and stop and waste valves shall be approved by the Town of Arlington for use in water service applications, upstream of backflow preventer.

2.23 SWING JOINTS

- A. Spray Sprinklers shall be installed on swing pipe assemblies, minimum length 6 inches, maximum 18 inches.
- B. Rotary sprinklers shall be installed on prefabricated PVC swing joint assemblies, minimum 315 psi rating and minimum length of 12-inches. Size shall match sprinkler inlet (Spears, Lasco or Equal).
- C. Quick coupling valves to be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double o-ring seals, minimum 315 psi rating and minimum length of 12 inches with brass insert and stabilizer (unless stabilizer is an integral part of the quick coupling valve).

2.24 WATER METER AND STRAINER

- A. Water meter shall be 2-inch in size or as per City of Arlington Water Department requirements.
- B. Water meter shall be provided to the contractor by the City of Arlington Water Department with a lay length of 17-inches as manufactured by Neptune, model T-10.

2.25 BACKFLOW PREVENTER DEVICE

- A. Backflow prevention device shall be a Reduced Pressure Assembly as per City of Arlington Water Department requirements. Backflow prevention device shall be as manufactured by Watts, model LF-009-QT-S or approved equal, maximum 12-psi pressure loss at full system flow. Backflow preventer for irrigation system shall be 2-inch.

2.26 CONCRETE BASE AND THRUST BLOCKS

- A. Standard concrete mix shall be in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,000 psi.
- B. All bell and gasket mainline pipe and fittings shall have thrust blocks sized and placed in accordance with pipe manufacturer's recommendations for standard concrete mix. Thrust blocks shall be installed at all tees, elbows, crosses, reducers, plugs, caps and valves. Company performing the work shall be responsible to insure the stability of all thrust blocks.
- C. Concrete base for outdoor controller enclosure shall be standard concrete mix. Size shall be as indicated on the details.

2.27 CRUSHED STONE

- A. Crushed stone shall be as specified in SECTION: EARTHWORK. Crushed stone shall be used under valve boxes as specified.

2.28 SAND

- A. Sand used for bedding of pipe shall be as specified in SECTION: EARTHWORK.

2.29 SPARE PARTS

- A. Supply the following tools and equipment to the Owner's Representative before final observation:
 - 1. Two (2) wrenches or keys for disassembling and adjusting each type of sprinkler head provided.
 - 2. Two (2) of each type sprinkler head and pattern (PC & FC) used in the project.
 - 3. Two (2) of each type nozzle used in the project.
 - 4. One (1) gate valve operating tool/wrench for each type of gate valve used in the project.
- B. Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown to the Owner.

PART 3 - EXECUTION

3.01 GENERAL

- A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work and areas for automatic irrigation.
- B. Examine all contract documents applying to this section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.
- C. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details. Legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- D. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the approved Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.

- E. Coordinate installation of all irrigation system materials, including pipe, to avoid conflict with trees, shrubs, or other plantings.
- F. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.
- G. At all times, protect existing and new landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the Work of another trade shall be reported at once.
- H. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

3.02 PIPE AND FITTINGS INSTALLATION

- A. Using proper width trencher chain, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.
- B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and lateral lines shall be carefully removed to the lines and depths as shown on the drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.
- C. Pipe shall be laid on undisturbed trench bottom provided suitable base is available - no rock larger than 1-inch or sharp edges; if not, excavate to 2-inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.
- D. Backfilling shall be accomplished as follows: backfill material shall contain no foreign matter and no rock larger than 1-inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.
- E. Restore grades and repair damage where settling occurs.
- F. Make all solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see Wire Installation).

- G. Clean bell and spigot ends and make all gasketed joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of lubricant, and wiping off any excess lubricant from each connection. Maximum deflection per joint shall not exceed manufacturer's recommendations.
- H. Mainline pipe shall have minimum 22 inches of COVER (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16 inches of COVER for PVC and 12 inches of cover for Polyethylene (excavate to invert as required by pipe size).
- I. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required to conform to manufacturer's specifications.
- J. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or backfilled until all water is removed from the trench. Pipe shall not be installed when water is in the trench or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.
- K. In installing irrigation pipe route the pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, the Contractor shall provide proper root pruning and sealing methods to all roots 1-inch and larger.
- L. Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.
- M. Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees.
- N. Throughout the guarantee period it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.
- O. Pulling of lateral pipe 2 inches and below will be allowed provided soil is suitable and specified depth of bury can be maintained.
- P. Install piping to all quick coupling valves that are part of or separate from the irrigation system.

3.03 THRUST BLOCKING

- A. All ringtite bell-end fittings shall be blocked with an adequately sized thrust block as per ASABE Standard S376.2. Blocking shall be in accordance with pipe and fitting manufacturer's recommendations. Thrust blocks shall be required at all changes in size and direction of bends, reducers, plugs and tees. Thrust blocks

shall be installed against undisturbed soil in all cases. Concrete thrust blocks shall utilize 3,000-psi standard concrete mixture. Bricks, stones, boulders, etc. will not be accepted as thrust blocks or thrust block material. Sakcrete will not be permitted as a thrust blocking material. Supply all material needed for thrust blocking.

- B. Size of thrust block shall be determined by working pressure, size and type of fitting, and soil conditions. Calculate area required for concrete thrust block in contact with soil. Refer to fittings manufacturer's thrust block sizing table and ASABE S376.2 to determine size of thrust block for each condition.
- C. Ensure stability of thrust blocks.
- D. Under no circumstances shall concrete block be approved for thrust blocks.

3.04 ELECTRICAL WIRE CONDUIT INSTALLATION

- A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controller and rain shut off.
- B. Conduit shall extend 18 inches beyond edges of walls and pavement.

3.05 PIPE SLEEVING INSTALLATION

- A. Sleeving shall be installed wherever piping is going under a non-soil area, and shall be indicated on the drawings. Minimum cover over all sleeving pipe shall be 24 inches.
- B. Sleeving shall extend 18 inches beyond edges of walls and pavement.
- C. If finished pavement is in place bore under the pavement for sleeving installation using personnel experienced in the procedure. Contractor shall be responsible for all damage to finished paving due to improper boring.

3.06 ISOLATION VALVE INSTALLATION

- A. Install isolation valves in a 10-inch round valve box on the PVC mainline, downstream of the point of connection at the water supply for complete system isolation. Also install isolation valves to isolate main line pipe on each side of pavement crossings over 12 feet in width including driveways and roads.
- B. Install all isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench.
- C. Check and tighten valve bonnet packing before valve box and backfill installation.
- D. Provide and install thrust block for ringtite valves.

3.07 VALVE BOX INSTALLATION

- A. Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve, manual flush valve, wire splice, traveler connection, etc.

- B. All valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of all boxes shall be at grade. All crushed stone to be supplied by the Contractor and installed before valve box. Crushed stone shall not be poured into previously installed valve boxes.
- C. Valve boxes shall be installed neatly at all times. Boxes shall be parallel or perpendicular to hard-scape edges and to other valve boxes installed in the same location. A sufficient amount of turf shall remain in place between each valve box and between valve boxes and hard-scapes
- D. Valve box extensions shall be provided as required on all valve boxes in order to install valve box covers at grade.
- E. Bricks, stones, etc. shall not be used to support valve boxes.

3.08 24 VOLT CONTROL VALVE INSTALLATION

- A. Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.
- B. Install at sufficient depth to provide more than 6-inch, nor less than 4-inch cover from top of valve to finish grade.
- C. Adjust zone valve operation after installation using the pressure regulating device and flow control device on valve to match specified performance.

3.09 WIRING INSTALLATION

- A. Wiring shall be installed along with the main line. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box. Each valve shall have a separate wire back to the controller.
- B. All wire shall be laid in trenches and shall be carefully backfilled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2 inches layer of sand or stone dust on the bottom before the wires are laid into the trench and backfilled. The wires shall have a minimum of 12 inches of cover. Wire not to be installed that day shall not be laid out.
- C. An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.

- D. Provide and install a common ground wire of white color. No white color shall be used for control wire. Control wire shall be red for sprinkler zones and orange for drip zones. Spare wiring shall be blue in color.
- E. All in-ground wire connections shall be waterproofed with 3M DBR/Y splice kits. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the Record Drawings.
- F. Provide a complete wiring diagram showing wire routing for the connections between the controller and valves. See section one for the inclusion of wiring diagram in operation and maintenance manuals.
- G. All wiring shall be in strict accordance with all local, state and national electrical codes.

3.10 CONTROLLER INSTALLATION

- A. Install controller on interior wall or new utility building and where directed by the Owner's Representative. Wire valves and rain sensor into controller, activate cellular communication and link central control system and set proper program.
- B. Wire controller to 120-volt electrical supply.
- C. Ground controller as per the specifications.
- D. Keys shall be turned over to the Owner's Representative.

3.11 RAIN SENSOR INSTALLATION

- A. Install rain sensor outside on exterior of utility building, a minimum of 10-ft high. Coordinate final location of sensor with the Owner's Representative. Rain sensor shall be in direct contact with the weather, with no obstructions to natural rainfall or shade and not in contact with the irrigation spray.
- B. Install climate sensor wiring within 1/2-inch conduit where exposed. All above ground wires shall be installed in conduits.

3.12 SPRINKLER INSTALLATION

- A. Spray sprinklers shall be installed flush (perpendicular) to grade on swing pipe assemblies, minimum length 6 inches, maximum 18 inches.
- B. All rotary sprinklers shall be installed on PVC unitized swing joints, sized to equal sprinkler inlet size (3/4-inch or 1-inch).
- C. Adjust sprinkler zone after installation using flow control device on valve.

3.13 QUICK COUPLING VALVE INSTALLATION

- A. Provide a minimum of three quick coupling valves within the automatic irrigation system spread out evenly in addition to after the isolation valve, outside at the point of connection.

- B. Additionally install quick couplers to the left of the bleachers as indicated on the Utility Plan and in a line along the west end of the field.
- C. Final locations and total quantities of quick coupling valves shall be shown on the drawings.

3.14 WATER METER INSTALLATION

- A. New 2-inch water meter, supplied by Town, for irrigation abatement, shall be installed upstream of new 2-inch reduced pressure zone backflow preventer, in 2-inch copper pipe. Meter installation shall be approved by the Town and be as per the meter manufacturer's recommendations. Design intent is to install meter in horizontal orientation.

3.15 BACKFLOW PREVENTER INSTALLATION

- A. New 2-inch reduced pressure zone backflow preventer shall be provided and installed in new utility building as indicated in the installation details. Backflow preventer shall be installed as per the manufacturer's requirements, in a horizontal orientation and as approved by the Town.

3.16 CHECK/TEST/START-UP/ADJUST

- A. Flushing:
 - 1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals or drip line, open the control valves and flush out the system under a full head of water.
 - 2. Sprinkler internals and riser nozzles as well as drip lines shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
 - 3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles or drip emitters for thirty (30) days after substantial completion of this portion of the landscape irrigation system.
- B. Testing:
 - 1. Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test.
 - 2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify the Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust sprinklers and/or sprinkler locations and drip lines as necessary or directed to achieve proper coverage.
 - 3. All testing costs shall be included in the irrigation system bid.

3.17 CLEANING AND ADJUSTING

- A. At the completion of the Work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinklers, drip lines, valve boxes and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and all sprinklers checked for consistency of delivering water. Adjustments shall be made to sprinklers and drip lines that are not consistent to the point that they match the manufacturer's standards. All sprinklers, drip line, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

3.18 ACCEPTANCE AND OPERATION BY OWNER

- A. Upon completion of the work and acceptance by the Owner, train Owner's personnel in the operation of the system (provide minimum 7 days written notice in advance of training). Furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. Guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.
- B. Conditions for acceptability of Work for start of maintenance by Owner issued by Owner or the Owner's Representative shall include but not be limited to:
 - 1. Punch list items complete and approved by Owner or the Owner's Representative.
 - 2. Landscape and traveler irrigation systems complete and in place.
 - 3. Record drawings complete.
 - 4. Maintain installation and watering schedules until all conditions noted above have been completed.

3.19 CLEAN UP

- A. Upon completion of all installation work, remove all leftover materials and equipment from the site in a safe and legal manner.
- B. Remove all debris resulting from work of this section.

- C. Re-grade, lightly compact, and replant around sprinklers or drip lines where necessary to maintain proper vertical positioning in relation to established grade.
- D. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with the Owner's Representative's requirements.

END OF SECTION

SECTION 32 90 00
PLANTING

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Planting of trees, shrubs, and groundcovers.
 - 2. Maintenance and guarantee.

1.03 SUBMITTALS

- A. Submit manufacturer's product data for the following:
 - 1. Soil analysis results;
 - 2. List of nurseries for selection of plant materials by Owner's Representative;
 - 3. Manufacturer's certificate of compliance for controlled release fertilizer issued by the manufacturer only, showing quantity of material ordered and specific job application;
 - 4. For all plant materials not selected in the field by the Owner's Representative, submit a complete list showing each type, each source of materials, the measured size of each, as well as photographs of materials, with scale figure.

1.04 QUALITY ASSURANCE

- A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.
- B. Codes and Standards: work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
- C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified

requirements and methods needed for proper performance of the work of this Section.

- D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before installing items specified.
- E. All plant materials shall be true to name according to "Standardized Plant Names," published by the American Joint Committee on Horticulture Nomenclature, 1942 edition. Each plant or bundle shall be tagged with the name and size of plants in accordance with the American Nursery & Landscape Association (ANLA), American Standard for Nursery Stock, ANSI Z60.1. In all cases, botanical names shall take precedence over common names.
- F. Quality and size shall conform to the current edition of "Horticultural Standards" for number one grade nursery stock as adopted by American Nursery & Landscape Association (ANLA).
- G. All plants and plant materials shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.

1.05 PROJECT CONDITIONS

- A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during, and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's Representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
- B. The Contractor shall remove all debris, construction equipment, and waste material from areas within the limit of work prior to inspection for acceptance.
- C. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.
- D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner's Representative before planting.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. All products and supplies shall be delivered to the job adequately protected from damage during transit.
- B. All products and supplies shall be stored off the ground and shall be protected against damage. Damaged products and/or supplies will be rejected and shall not be employed in the work.

- C. Deliver all items to the job site in their original containers with all labels intact and legible at time of Owner's Representative's inspection.
- D. Immediately remove from the site all plants which are not true to name, and all materials which do not comply with the specified requirements.
- E. Use all means necessary to protect plant materials before, during, and after installation and to protect the work and materials of all other trades.
- F. Replacements: in the event of damage, immediately make all replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Loam/Topsoil: friable, typical of local cultivated topsoil containing 5% (min.) decayed organic matter (humus), no toxic materials, from well drained, arable site, reasonably free of subsoil, stones, earth, clods, sticks, roots or debris.
 - 1. Test for acidity, fertility, and general texture by a recognized commercial or government agency; report findings and recommendations to the Owner's Representative. Add soil conditioners as per testing agency's report and recommendations.
 - 2. Deliver no topsoil in frozen or muddy condition.
- B. Compost Manufactured Topsoil
 - 1. The Contractor is encouraged to use Compost Manufactured Topsoil in lieu of, or in addition to, new and/or existing on-site topsoil.
 - 2. This material shall be created from compost blended with soils stockpiled on-site.
 - 3. Materials:
 - a. Compost shall be derived from organic wastes including sawdust, clean ground wood, leaf and yard residues, and biosolids that meet all State Environmental Agency requirements. The material shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no material toxic to plant growth.
 - i. Compost shall meet the following:

Parameters	Range
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pH	5.5 - 8.0
Moisture content	35% - 55%
Soluble salts	< 4.0 mmhos (dS)
C:n ratio	15 – 30:1
Particle size	< 3/4"
Organic matter content	> 20%
Bulk density	< 1200 lbs. Per cubic yard
Foreign matter	< 1% (dry weight)

- ii. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements. Generator shall supply documentation showing state approval for intended use.
- iii. Product shall be Agresoil Compost as distributed by Agresource, Amesbury, MA 01913, 800-313-3320, or approved equal.

- b. Soil Component: Soil shall consist of loose, friable soil, free of ice, snow, and rubbish with no admixture of refuse or material toxic to plant growth. Soil shall be reasonably free of stones, lumps, roots, and weeds or similar objects larger than two inches in diameter.

- i. Soil shall meet additional parameters:

Parameters	Range
pH	5.5 – 7.5
2	35% - 55%
Soluble salts	2.5 mmhos (dS)
Stone and debris	< 5% (by weight)
Foreign matter	< .05% (by weight)

- ii. Particle Size:

- 1) 100% by volume must pass a 2-inch screen.
 - 2) 95% by volume must pass a ¾-inch screen.
 - 3) Not more than 60% of the soil by weight shall be less than .05 mm (very fine sand) of which no more than 25% by weight shall consist of particles less than .002 mm (clay).
- 4. Compost Manufactured Topsoil shall consist of soil as described in Section 2.01.B.3.b amended with compost as described in 2.01.B.3.a. Compost manufactured topsoil shall be free of refuse, stones, lumps, roots, and weeds or similar objects larger than two inches in diameter. Compost manufactured topsoil will be uniformly mixed to meet the final requirements listed below:

Parameters	Range
pH	5.5 – 8.0
Moisture content	30% - 55%
Soluble salts	2.0 mmhos (dS)
Organic matter	> 5% (by weight)
Foreign matter	< 0.5% (by weight)

- a. Particle Size:
 - i. 100% by volume must pass through a 2-inch screen.
 - ii. 95% by volume must pass through a ¾-inch screen.

- 5. Compost Manufactured Topsoil shall meet the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand (0.05 – 2.0 mm dia. range)	45-75	60
Silt (0.002 - 0.05 mm dia. range)	15-35	25
Clay (less than 0.002 mm dia. range)	5-20	15

- C. Superphosphate: finely ground phosphate rock with eighteen percent (18%) minimum available phosphoric acid.
- D. Bone Meal: commercial raw bone meal, finely ground, 1% nitrogen and 18% phosphorus acid (min.).
- E. Manure: well rotted, unleached, cattle manure, reasonably free of wood shavings, sawdust or other litter and no chemicals or other ingredients harmful to plants. Dehydrated manure (Bovung or equal) is acceptable.
- F. Fertilizer: Fertilizer for lawns shall be chosen based on the results of soil tests performed as part of the requirements of this specification. All existing site loam and new topsoil brought to the site shall be tested.
 - 1. Recommendations for amendments shall be made by the testing agency or other qualified soils engineers. The recommendations and product submittals shall be forwarded to the Owner's Representative for approval.
- G. Compost - shall be a well-decomposed, stable, weed free organic matter source. It shall be derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); or yard trimmings.
 - 1. Mix shall meet all state environmental agency requirements.
 - 2. The product shall contain no substances toxic to plants, will possess no objectionable odors, and shall not resemble the raw material from which it was derived.

3. For acid loving plants, only use compost that has not received the addition of liming agents or ash by-products.
4. Compost shall meet the following:

Parameters	Range
Ph	5.5 - 8.0
Moisture content	35% - 55%
Soluble salts	< 4.0 mmhos (ds)
C:n ratio	15 – 30:1
Particle size	< 3/4"
Organic matter content	> 20%
Bulk density	< 1200 lbs. Per cubic yard
Foreign matter	< 1% (dry weight)

- H. Lime: ground, dolomite limestone, 95% passing 100 mesh screen.
- I. Planting mixture: topsoil thoroughly incorporated with well rotted manure or equivalent dehydrated manure or bone meal and peat proportioned 1 cubic yard to 7 cubic yards topsoil.
- J. Mulch: aged pine bark consisting of the outer bark of pine trees with minimum hardwood bark; Bark shall be thoroughly mixed and aged in stock piles a minimum of 6 months, partially decomposed, dark brown in color, and generally free of chunks of wood thicker than 1/4". Aged pine bark containing an excess of fine particles will not be acceptable.
- K. Weed Barrier: Contractor shall furnish a weed barrier for all mulched beds. Weed barrier shall be submitted for approval by the Landscape Architect.
- L. Water: Contractor shall furnish hose and connections required for watering all plant materials until completion of the project.
- M. Tree Staple: Install two TreeStaple™ brand below ground stabilizing system tree "staples," or approved equal, per root ball as detailed on the Drawings, ONLY if necessary per site conditions.
- N. Tree Staking - Hardwood Stake - for tree guying - 30" long (min.). For tree staking - 8' long (min.). Install as detailed on the Drawings, where required by site conditions.
- O. Wire - pliable No. 12 to 14 gauge galvanized soft steel wire with rubber hose or Chain Lock brand plastic tree tie or approved equivalent, where required by site conditions.
- P. Wrapping material - first quality, heavy, waterproof crepe paper manufactured for this purpose; not less than 4" wide, where required by site conditions.

2.02 PLANT MATERIALS

- A. Furnish and install all plants as per Drawings in quantities listed on plant materials list. If there is any discrepancy between quantities listed and shrubs shown, notify the Owner's Representative. Contractor shall be responsible for quantity of shrubs graphically shown on plans.
- B. All plants shall be nursery grown unless authorized to be collected.
- C. Plants: in accordance with USDA Standard for Nursery Stock, latest edition, hardy under climatic conditions similar to locality of project, typical of species or variety, normal habit of growth, sound, healthy, vigorous, well-branched, densely foliated when in leaf, free of disease, insect pests, eggs, or larvae, with well developed root systems.
- D. If plants of specified kind or size are not available within a reasonable distance, substitutions may be made upon request, if approved by Owner's Representative.
- E. Plant Dimensions: conform to USDA Standard for Nursery Stock, latest edition, as specified. Exceptions as follows
 - 1. Plants larger than specified may be used if approved by Owner's Representative at no increase in contract price. Increase spread of roots or earth ball in proportion to size of plant.
 - 2. Undersize plants (10% max.) in any one variety or grade may be used if approved by the Owner's Representative. Provide sufficient plants above size to make average equal to or above specified grade. Undersize plants shall be larger than average size of next smaller grade.
- F. Balled and Burlapped (B & B) plants: dig with firm natural earth roots. Made balls are unacceptable.
 - 1. Protect B & B plants not planted immediately upon delivery with soil, wet moss, or other acceptable material. Prevent voids among roots with careful filling. Bind no plants with wire or rope so as to damage bark or break branches.
- G. Container grown plants: grown in container long enough for root system to have developed sufficiently to hold its soil together firm and whole. Plants loose in container will not be acceptable.
- H. Plugs shall be one-year old plants in containers 2" square and 3" deep minimum as grown by American Natives Prairie Nursery, Inc., Westfield, WI, (800) 476-9453, Prairie Moon Nursery, Winona, MN (866) 417-8156, or New England Wetland Plants, Amherst, MA (413) 548-8000, or other approved source.
- I. Plants are subject to inspection and approval at place of growth for conformity to specifications as to quality, size, and variety. The expenses incurred by the

Owner's Representative for such inspections shall be born by the Contractor. Owner's Representative reserves right of inspection upon delivery at the site or during progress of work or right of rejection due to damage suffered in handling or transportation. Remove defective plants immediately from site. Plants to be accompanied by State Nursery inspection certification, if required.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PLANTING OPERATIONS

- A. The Landscape Architect shall approve all perennial bed outlines and perennial plant locations in the field prior to installation.
- B. Install weed barrier in all mulched beds.
- C. Plant trees and shrubs immediately upon delivery to the site and approval by the Owner's Representative. Layout individual tree and shrub locations; Stake locations, and obtain the Owner's Representatives approval before proceeding with planting work.
- D. Planting may be done whenever weather and soil conditions are favorable or as otherwise authorized by Owner's Representative. If this is not feasible, heel-in material with damp soil or mulch to protect from sun and wind.
- E. Notify Owner's Representative at least one week prior to beginning planting operations.
- F. Excavate tree pits 2'-0" diameter (min.) and shrub pits 12" diameter (min.) greater than ball of earth or spread of roots and sufficiently deep to allow for 4" thick layer of compacted planting mixture beneath ball or roots.
- G. Locate pits prepared and backfilled with planting mixture to grade prior to planting by staking and recording on plans for location when planting proceeds.
- H. Set plants in center of pits, plumb and straight, with crown of plant 1" higher, after settlement, than surrounding finished grade.
- I. When B & B trees are set, compact topsoil mixture around bases of balls to fill all voids. Remove burlap, ropes or wires from top one third (1/3) of balls before filling in with planting mixture.

- J. Thoroughly compact planting mixture around roots or balls and water immediately after plant pit is backfilled. Form a shallow basin slightly larger than pit with a ridge of sod or mulch to facilitate and contain watering. Cultivate soil in shrub beds, rake smooth and neatly outline after planting. Provide 12" (min.) of loam between all shrubs and 6" (min.) between all ground covers.
- K. Distribute controlled release fertilizer packets equidistant within the planting pit adjacent to the root ball but not in direct contact with the roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged.
- L. Application rates as follows:

Planting Item	Size	No. of Packets
Deciduous Trees:	1-3" cal.	3
	4-6" cal.	4
Shrubs:	2-3'	2
	over 3'	3
Evergreen Trees:	5-10'	4
	over 10'	5
Perennials:	1 -3 gal.	1
Groundcover:	2" plug	none

- M. Stake or guy trees as detailed on the Drawings, only if necessary per site conditions, as directed by the Owner's Representative.
- N. Prune each plant in accordance with ANLA standards to preserve natural character. Remove all dead wood, suckers, broken or badly bruised branches and approximately 1/4 of wood. Prune with clean, sharp tools.
- O. Cover all tree and shrub pits immediately after planting with 3" (min.) layer of specified mulch. Limit of mulch for trees shall be area of pit; for shrubs in beds, entire area of shrub bed. Mulch shall be kept 2" clear of trunk.
- P. Notify Owner's Representative immediately if rock or underground obstructions are encountered in plant pit excavation.
- Q. Contractor shall furnish plans showing locations of underground utilities encountered, as required.
- 3.03 SPREADING OF COMPOST MANUFACTURED TOPSOIL
- A. Compost manufactured topsoil shall be spread evenly upon the previously prepared subgrade surface to the depth specified on the plans for all plant beds.
- B. For all woody plant material, compost manufactured topsoil shall be placed around rootball to even the base of the plant's main leader with the soil grade. All compost manufactured topsoil shall be firmly dressed into place to prevent settling and provide support.

- C. Compost manufactured topsoil used for planting beds of herbaceous plants shall be spread in such a manner as to establish a loose, friable bed for installation of plant material.

3.04 MAINTENANCE – PLANTING

- A. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum of 90 days following final acceptance of all planting.
- B. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include but is not limited to watering, weeding, cultivating, re-mulching, tightening and repairing of guys, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.
- C. Plants shall be inspected for watering needs at least twice each week and watered as necessary to promote plant growth and vitality.
- D. Stakes shall be kept plumb and neat in appearance. Guys, wires, and anchoring cables shall be tightened and repaired weekly.
- E. Planting beds and individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
- F. Plants that die during the maintenance period shall be removed and replaced at once, unless designated otherwise by the Owner's Representative.
- G. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed.
- H. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If requested by the Owner's Representative, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures.

3.05 ACCEPTANCE STANDARDS FOR PLANTING

- A. Following the completion of all planting, the Contractor shall request, from the Owner's Representative in writing, a formal inspection of the completed work. If plant materials and workmanship for the site are acceptable, written notice will be given to the Contractor stating that the work has received acceptance and that the 90 days maintenance and the one year guarantee period has commenced from the date of acceptance.
- B. If a number of plants are sickly or dead at the time of inspection or if, in the Owner's Representative's opinion, workmanship is unacceptable, written notice will be given by the Owner's Representative to the Contractor in the form of a

punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all the plants shall be extended until replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.

3.06 GUARANTEE FOR PLANT MATERIALS

- A. Plants shall be guaranteed for a period of one year after written notification of acceptance and shall be alive and in satisfactory growth at the end of the guarantee period.
- B. At the end of the guarantee period, a final inspection will be held to determine whether any additional plant material replacements are required. Each plant shall show at least 75% healthy growth and shall have the natural character of its species as determined by the Owner's Representative. Plants found unacceptable shall be removed promptly from the site and be replaced during the normal planting season, until the plants live through one year.
- C. Replacement plants shall have a one year guarantee from time of planting.

END OF SECTION

SECTION 32 92 15
MEADOW RESTORATION SEED

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Provide all topsoil required for work of this Section.
 - 2. Screen stripped and stockpiled topsoil.
 - 3. Provide additional new topsoil from off-site sources as required to complete work for this Section.
 - 4. Provide all soil amendments, fertilizers, erosion controls, and mulches as required for work in this Section.
 - 5. Scarify subsoil in preparation for loaming.
 - 6. Spread and fine grade topsoil for all seeded areas.
 - 7. Meadow Restoration Seed as shown on the drawings (including all bioretention areas) and as required for work in this Section.
 - 8. Provide temporary fencing as required for work in this Section.
 - 9. Provide maintenance and guarantee.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's data for each item showing installation and limitations in use.
- B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory or a recognized commercial or governmental agency such as University of Massachusetts extension services.
 - 1. Analysis shall state percentages of organic matter; gradation of sand, silt, and clay content; cat ion exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

2. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.
- C. Certification of Seed: From seed vendor for each seed, provide mono stand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- D. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- E. Qualification Data: For landscape Installer.
- F. Material Test Reports: For existing surface soil and imported topsoil.
- G. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- H. Maintenance Instructions: Provide recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.04 QUALITY ASSURANCE

- A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.
- B. Codes and Standards: work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
- C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. Installer Qualifications: Employ a qualified landscape installer whose work has resulted in successful lawn establishment.
- E. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- F. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

- G. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before installing items specified.
- H. All seed and amendments shall comply with all Federal, State and local laws and regulations requiring inspection for plant disease and insect control.
- I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.05 PROJECT CONDITIONS

- A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during, and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's Representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
- B. The Contractor shall remove all debris, construction equipment, and waste material from areas within the limit of work prior to inspection for acceptance.
- C. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.
- D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner's Representative before spreading topsoil.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. All products and supplies shall be delivered to the job adequately protected from damage during transit.
- B. All products and supplies shall be stored off the ground and shall be protected against damage. Damaged products and/or supplies will be rejected and shall not be employed in the work.
- C. Deliver all items to the job site in their original containers with all labels intact and legible at time of Owner's Representative's inspection.
- D. Immediately remove from the site all materials which do not comply with the specified requirements.
- E. Use all means necessary to protect seed from moisture and other contaminants which may adversely effect proper germination.
- F. Use all means necessary to protect fertilizers, amendments and other materials from moisture and other contaminants which may adversely affect their efficacy.

- G. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.07 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Woodland and Meadow seeding
 - a. Spring Planting: between May 1 and June 1.
 - b. Fall Planting: between October 31 and December 1.
- B. If seeding out of season as described above, the Contractor is still obligated by all conditions and maintenance responsibilities described under Part 3, until final acceptance of lawn areas.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.08 MEADOW RESTORATION SEED MAINTENANCE

- A. Refer to Section 3 for maintenance requirements.

PART 2 - PRODUCTS

2.01 LAWN PRODUCTS

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 3/4 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil stockpiled from on-site stripping may be utilized if in compliance with the requirements for new topsoil.
 - 2. All topsoil that was stripped and stockpiled shall be screened to a maximum stone size of 3/4 in.
 - 3. The existing topsoil shall be tested by the Contractor, at the expense of the Contractor, and the results of this test submitted to the Owner's Representative for review. The contractor is responsible for modifying the existing topsoil as required to meet the specification for new topsoil.
- B. Compost Manufactured Topsoil
 - 1. The Contractor is encouraged to use Compost Manufactured Topsoil in lieu of, or in addition to, new and/or existing on-site topsoil.

2. This material shall be created from compost blended with soils stockpiled on-site.

3. Materials:

- a. Compost shall be derived from organic wastes including sawdust, clean ground wood, leaf and yard residues, and bio solids that meet all State Environmental Agency requirements. The material shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no material toxic to plant growth.

- i. Compost shall meet the following:

Parameters	Range
pH	5.5 - 8.0
Moisture content	35% - 55%
Soluble salts	< 4.0 mmhos (dS)
C:n ratio	15 – 30:1
Particle size	< 3/4"
Organic matter content	> 20%
Bulk density	< 1200 lbs. Per cubic yard
Foreign matter	< 1% (dry weight)

- ii. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements. Generator shall supply documentation showing state approval for intended use.

- iii. Product shall be Agresoil Compost as distributed by Agresource, 978-388-5110; www.agresourceinc.com, or approved equal.

- b. Soil Component: Soil shall consist of loose, friable soil, free of ice, snow, and rubbish with no admixture of refuse or material toxic to plant growth. Soil shall be reasonably free of stones, lumps, roots, and weeds or similar objects larger than two inches in diameter.

- i. Soil shall meet additional parameters:

Parameters	Range
pH	5.5 – 7.5
2	35% - 55%
Soluble salts	2.5 mmhos (dS)
Stone and debris	< 5% (by weight)
Foreign matter	< .05% (by weight)

- ii. Particle Size:

- 1) 100% by volume must pass a 2-inch screen.
 - 2) 95% by volume must pass a ¾-inch screen.
 - 3) Not more than 60% of the soil by weight shall be less than .05 mm (very fine sand) of which no more than 25% by weight shall consist of particles less than .002 mm (clay).
4. Compost Manufactured Topsoil shall consist of soil as described in Section 2.01.B.3.b amended with compost as described in 2.01.B.3.a. Compost manufactured topsoil shall be free of refuse, stones, lumps, roots, and weeds or similar objects larger than two inches in diameter. Compost manufactured topsoil will be uniformly mixed to meet the final requirements listed below:

Parameters	Range
pH	5.5 – 8.0
Moisture content	30% - 55%
Soluble salts	2.0 mmhos (dS)
Organic matter	> 5% (by weight)
Foreign matter	< 0.5% (by weight)

- a. Particle Size:
 - i. 100% by volume must pass through a 2-inch screen.
 - ii. 95% by volume must pass through a ¾-inch screen.
5. Compost Manufactured Topsoil shall meet the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand (0.05 – 2.0 mm dia. range)	45-75	60
Silt (0.002 - 0.05 mm dia. range)	15-35	25
Clay (less than 0.002 mm dia. range)	5-20	15

C. Amended Bioretention Area Soil

1. Refer to Bioretention Area Specification.

D. New Topsoil

1. New Topsoil: Shall be natural, fertile loam typical of cultivated topsoils of the locality, containing not less than 3.5% or more than 8% by weight, of decayed organic matter (humus) as determined by ASTM F-1647. If organic amendments are needed to obtain the specified matter content of the topsoil, the organic matter source may be a compost material.

Compost shall be created in an in-vessel system, with an ash content not exceeding 40%.

2. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris.
3. Topsoil shall be free of Quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of Nutgrass, Cyperus Esculentus, and all other primary noxious weeds.
4. Topsoil shall have a pH not less than 6.0 or greater than 7.0.
5. Topsoil shall not be delivered or used while in a frozen or muddy condition.
6. Topsoil shall conform to the following particle size distribution, as determined by pipette method in compliance with ASTM F-1632:

Sand	40-60%
Silt	30-40%
Clay	5-20%

7. If determined by a soil test the existing topsoil that was stripped does not meet these specifications, the topsoil shall be amended to provide acceptable topsoil for use.

E. Soil Analyses

1. The Contractor shall submit representative samples of topsoil he intends to bring onto the site, and samples of topsoil that was stockpiled from on-site stripping, to a Soil Plant Testing Laboratory acceptable to the Owner's Representative. All reports shall be sent to the Owner's Representative for approval. The cost for testing and analysis of the soils shall be borne by the Contractor.
2. Samples of topsoil to be brought to the site must be approved prior to delivery. Deficiencies in the topsoil shall be corrected by the Contractor.
3. Testing reports shall include the following tests and recommendations:
 - a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System;
 - b. The silt and clay content shall be determined by a Pipette Test of soil passing the No. 270 sieve;
 - c. Percent of organics shall be determined by an Ash Burn Test or Walkley/Black Test (ASTM F-1647);

- d. Tests for gradation and organics shall be performed by a private testing laboratory approved by the Owner's Representative. Tests for soil chemistry and pH may be performed by a public extension service agency;
- e. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH);
- f. Soil analysis tests shall include recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular objectives noted;
- g. All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists.

F. Soil Amendment (Washed Screened Sand)

- 1. Washed screened sand for use as a soil amendment to improve drainage properties and to reduce compaction of existing stripped topsoil or new topsoil, shall meet the following mechanical analysis:

Sieve Size	% Passing by Weight
4 in.	100
No.4	93
No. 8	83
No. 16	71
No. 30	49
No. 50	18
No. 100	2
No. 2000	2

G. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent in the form of dolomitic limestone.

- 1. Lime shall be an approved agricultural limestone containing no less than fifty (50%) percent of total carbonates and twenty five (25%) percent total magnesium with a neutralizing value of at least one hundred (100%) percent;
- 2. The material shall be ground to such a fineness that forty (40%) percent will pass through a Number 100 U.S. Standard Sieve, and ninety eight (98%) percent will pass through a Number 20 U.S. Standard Sieve;
- 3. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis;
- 4. Any lime which becomes caked or otherwise damaged, making it unsuitable for use, will be rejected.

H. Fertilizer

1. Type 1 Fertilizer: General starter fertilizer with a nutrient analysis 19-26-5, N-P-K. A minimum of 75% of the total nitrogen 19% is derived from urea and methylene ureas; a minimum of 25% from monoammonium phosphate. A minimum of 2.1% from water-insoluble methylene ureas; remaining 97.9% from water-soluble urea, slowly available methylene urea and monoammonium phosphate. Phosphorus (26%) from monoammonium phosphate; potash (5%) and sulfur as sulfate (1.8%) from potassium sulfate;
2. Type 2 Fertilizer: Fertilizer with pre-emergence weed control, containing active ingredient: siduron (3.1%). Analysis 16-21-4. A minimum of 75% of total nitrogen (16%) derived from urea and methylene ureas, with a minimum of 24.4% from monoammonium phosphate. A minimum of 22% is water insoluble nitrogen, with remaining 77.5% from urea, methylene urea and monoammonium phosphate. 21% phosphorous and 3% Potash;
3. Type 3 Fertilizer: All purpose fertilizer with a nutrient analysis of 36-3-7, N-P-K. A minimum of 30% of total nitrogen (36%) is from polymer-encapsulated sulfur-coated urea providing 21 percent slow release nitrogen. A minimum of 98.2% derived from coated and uncoated urea, and 1.8% from monoammonium phosphate. Phosphorus (3%) from monoammonium phosphate; potash (7%) from potassium chloride; sulfur (3.6%) from elemental sulfur;
4. Type 4 Fertilizer: Nutrient resource analysis of 32-3-10 N-P-K. A minimum of 97 percent of total nitrogen shall be derived from urea and methylene ureas. A minimum of 21 percent is from water-insoluble methylene ureas. Phosphorus - 3 percent shall be derived from monoammonium phosphate; potash 10 percent and sulfur as sulfate 3.5 percent from potassium sulfate.

I. Water

1. Water shall be supplied by the Owner unless otherwise specified.
2. Seeded Areas:
 - a. The Contractor is responsible for providing all equipment, hoses, etc. for watering throughout the project and until final acceptance of seeded areas by the Owner's Representative.

J. Herbicides, Pesticides and Fungicides

1. Herbicides, pesticides, and fungicides may be used subject to the approval of the Owner's Representative, and handled by State Licensed operators only.

K. Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

1. Seed shall be clean, new crop seed, composed of a mixture of varieties, mixed in proportion by weight, and tested for minimum percentages of purity and germination. Submit proposed mixture to the Owner's Representative for approval.
2. Meadow Restoration Seed Mix (Seed Mix #1):
 - a. "New England Conservation/Wildlife Mix" supplied by New England Wetland Plants, Inc., 820 West Street, Amherst, MA 01002, or approved equal. Apply at rate of 1 lb. per 1750 sf.
 - b. Nurse crop shall be included in all Meadow Restoration seeding areas, and shall consist of the following:

Agrostis alba	REDTOP	2.0	lbs
Avena sativa	SEED OATS	30.0	lbs
Lolium multiflorum	ANNUAL RYE	15.0	lbs
Total Cover Crop/Ac		47.0	lbs

3. Meadow Restoration (Seed Mix #2):
 - a. "Low Growing Meadow for Medium Soils" supplied by Prairie Nursery, Inc. P.O. Box 306 Westfield, WI 53964, or approved equal. Apply at rate of ¼ lb.(pure live seed) per 1000 sf.
 - b. Nurse crop shall be included in all Meadow seeding areas, and shall consist of the following:

Agrostis alba	REDTOP	2.0	lbs
Avena sativa	SEED OATS	30.0	lbs
Lolium multiflorum	ANNUAL RYE	15.0	lbs
Total Cover Crop/Ac		47.0	lbs

L. HYDROMULCH (Seed Mixes #1-2)

1. Hydromulch: Shall be Terra-Sorb GB, or an approved equal. Add Terra-Sorb to the hydroseed tank at the amount of 60 pounds per acre.

M. TEMPORARY FENCE

1. Temporary Fence shall consist of 2"x2"x3'-0" posts, driven into the ground a minimum of 1'-0", and spaced a maximum 8' o.c. Twine shall be tied securely to the post tops to create a barrier to mowing equipment.

N. EROSION CONTROL BLANKET

1. Erosion Control Blanket for the Bioretention area shall be North American Green (NAG) S75BN, or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBSOIL

- A. Prior to spreading topsoil, subsoil should be rough graded to correspond with finish grades as indicated on the Drawings. Sub-grade shall slope to allow for subsurface drainage. Depressions shall be filled, and areas that are highly compacted shall be loosened to a depth which is adequate for the passage of gravitational water through the subsoil.
- B. After acceptance of subsoil grades, loosen and mix subgrade material 2 to 4 inches deep. Remove stones over 2 inches, sticks, rubbish, and other deleterious materials which may impede the healthy and vigorous growth of grass. Move no heavy objects or machinery, except as necessary for the spreading of topsoil, over seed beds after preparation of subgrade.
- C. Subsoil which becomes compacted due to excessive construction activity shall be loosened as directed by the Owner's Representative at no additional cost to the Owner.

3.02 SPREADING OF TOPSOIL

- A. Immediately after approval of subgrade, evenly spread and lightly compact approved topsoil to finish grades as indicated on the Drawings. Do not spread topsoil which is in a muddy or frozen condition. Handle no topsoil when dry or above the plastic limit. Install a minimum of six (6") inches of topsoil to lawn areas unless otherwise indicated on the Drawings.
- B. When possible, spreading of topsoil shall be performed from the center of the lawn area to the perimeter. Contractor may use alternate spreading pattern as approved in writing by the Owner's Representative.
- C. Caution should be exercised to minimize or eliminate travel over areas previously covered with topsoil. Topsoil which becomes compacted due to excessive construction activity shall be stripped and re-spread, or loosened as directed by the Owner's Representative at no additional cost to the Owner.

3.03 SPREADING OF COMPOST MANUFACTURED TOPSOIL

- A. When used in lieu of or in addition to existing topsoil, compost manufactured topsoil shall be spread evenly upon the previously prepared subgrade surface to the depth specified on the plans. The compost manufactured topsoil shall be spread in such a manner as to establish a loose, friable seed bed. Measures shall be taken on steep grades to slow run-off.

3.04 SPREADING OF AMENDED BIORETENTION AREA SOIL MIX

- A. Refer to Bioretention specification for requirements.

3.05 MEADOW RESTORATION SEED BED PREPARATION (SEED MIXES #1-2)

- A. Finish Grading: Place topsoil and/or amended bioretention area soil mix to the depths specified on the drawings within the designated landscape planting zones.
 - 1. Fine grade planting areas to remove washes or rills, water pockets or irregularities to provide a uniform surface plane true to grade and cross-section.
 - 2. Soil should be friable, reasonably free of subsoil, clumps of clay, brush, weed propagules (seeds, rhizomes, and plants). Remove debris and other material that may be deleterious to plant development.
 - 3. Lightly disk area with cultivator or other equivalent to a minimum three (3) inch depth.

3.06 SEEDING

- A. Schedule:
 - 1. Meadow Restoration Seeding (mixes #1-2): The specified native seed mix shall be installed during one of the following time periods:
 - a. Spring planting: May 1st – June 1st
 - b. Fall dormant planting: October 31st – December 1st
 - c. If special conditions exist which warrant installation outside the normally recognized seed installation season, submit a written request to the Design Professional describing conditions and stating the proposed variance as well as the proposed preparation activities and timing of such activities. If approved, the installation contractor shall be responsible for any additional preparation work that may be required, as well as the supplemental watering at a frequency and duration for proper vegetation establishment and development.
- B. If seeding out of season as described above, the Contractor is still obligated by all conditions and maintenance responsibilities described under Part 3, until final acceptance of all seeded areas.
- C. Before seed is sown, scarify soil and rake until surface is smooth, friable, and of uniformly fine texture. Seed evenly at supplier's recommended rates; lightly rake and water with fine spray. Method of seeding may be varied at discretion of Contractor. It is his or her responsibility to establish a smooth, uniform turf composed of approved grasses. Do not use wet seed which is moldy or otherwise damaged in transit or storage.
- D. Mulch bank areas of a 3 to 1 slope or greater with straw mulch at a rate of 1-1/2 to 2 tons per acre. Secure mulch at Contractor's discretion as to method or need. Wood fiber mulch may be substituted at rate of 1,400 pounds per acre at same time as seed and fertilizer.

3.07 MEADOW RESTORATION SEED INSTALLATION (SEED MIXES #1-2)

- A. Native Seed Installation. Uniformly seed all areas with their appropriate mixes at their designated rates.
 - 1. Native Seed Planting Zones. The native seed mixes shall be uniformly installed. Prior to seeding, methods shall be coordinated and approved by the Design Professional for each of the designated planting zones. Based on approved installation method by Design Professional, the following drill and broadcast seed requirements shall be followed.
 - a. Broadcast Seed:
 - 1) Prior to installation, uniformly mix seed with approved inert material, e.g. perlite, #2 sand, etc.
 - 2) Seed shall be uniformly broadcast at the specified rates.
 - 3) Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 4) Area shall be raked/rolled to ensure adequate seed-soil contact.
- B. Hydromulch Installation: After seeding the contractor shall hydromulch, unless shown otherwise on the Contract Drawings.
- C. Meadow seeding within Bioretention areas shall be covered with Erosion Control Blanket after seeding.
- D. Temporary Fence Installation: After seeding the contractor shall install the temporary fence as shown on the Contract Drawings. Posts shall be spaced a maximum of 8' apart. Twine shall be tied securely to the top of each post creating a barrier to discourage regular mowing or native seeded areas.

3.08 MEADOW RESTORATION SEED WARRANTY

- A. Special Warranty: Warrant the native seeding for two years from the date of Substantial Completion, against defects including death, disease or infestation, and unsatisfactory growth, except for defects resulting from neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
- B. Warranty/Performance Standards:
 - 1. At the end of the Warranty Maintenance Period, there shall be no bare spots greater than one-half (0.5) square meter or solid stands of weeds of more than one (1) square meter within the seeded areas.

2. Thirty (30) percent of the seeded native species within each corresponding planting zone shall be alive and growing in a healthy condition at the end of the second full growing season.

C. Replacement:

1. During the Warranty Maintenance Period reseed at no expense to the owner, all areas that the Design Professional determines are unacceptable or poorly established.
2. All reseeded shall be in accordance with the original specifications and installed during the next available seeding season following notification to reseed.

3.09 MEADOW RESTORATION SEED MAINTENANCE

- A. Begin maintenance immediately after each area is seeded and continue until acceptable native seeding is established, but for not less than two (2) years from date of Substantial Completion.
- B. Maintain and establish native vegetation by watering, weeding, mowing, trimming, reseeding, and other operations. Re-grade and replant bare or eroded areas.
- C. First and Second year maintenance - Subsequent to installation, mowing shall occur when vegetation reaches 12 to 15-inch height. Mow to no less than six (6) inches by rotary mowing or weed eater to prevent weeds from setting seed. Mowing heights and dates should be adjusted to maximize weed control and minimize damage to seeded species. For areas not accessible with mowing equipment, areas shall be cut to above specified height with a string trimmer or equivalent.
- D. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep the native seeding uniformly moist.
 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly seeded areas.
 2. Water seeded native areas in conjunction with the Mesic Prairie planting zone, at a minimum rate of ½ inch per week for 8 weeks after seeding, and thereafter as needed for successful establishment of native seeding, or as specified by the Design Professional.
- E. Weed control: Control weeds during the Warranty Maintenance Period to the satisfaction of the Design Professional, with hand weeding; spot herbicide application, trimming, etc. as approved by the Design Professional. Do not let weedy volunteer species exceed 25% of total ground cover unless a different rate is agreed to in writing prior to contract award.

1. Hand weed and application of appropriate herbicide (by licensed applicator) at a minimum, six (6) times each growing season during the Warranty Maintenance Period.
2. Hand pulling should include the removal of all aboveground and belowground stems, roots, and flower masses prior to the development of seeds. Care should be taken to disturb as little soil as possible during hand pulling to avoid exposure of additional weed seed in the soil layer.
3. Contractor shall protect bioretention basins from silt and debris. If at any point during construction the bioretention basin get washed out or silt build up, it is the responsibility of the contractor to remove the silt so as to have a clean topsoil material and re-seed as necessary.

3.10 INSPECTION AND ACCEPTANCE

- A. The Owner's Representative shall inspect the lawns upon written request by the Contractor. The request shall be received at least ten days before the anticipated date of inspection.
- B. Final acceptance will not be granted until all seeded areas are in satisfactory condition
- C. If the grass is in satisfactory condition, the Contractor's care and maintenance responsibilities will end. If the grass stand is unsatisfactory, the Contractor's maintenance responsibility shall continue, including a normal program of mowing, irrigation, reseeding, fertilization, and repair until an acceptable stand of grass is achieved.

3.11 CLEAN UP

- A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner's Representative, at no cost to the Owner.

END OF SECTION

SECTION 33 10 00
WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. The work under these items consists of furnishing all materials, labor, tools and equipment, and performing all operations necessary to complete the water service as shown on the Plans and specified herein.
- B. The work of these items consists of furnishing and installing, testing and disinfecting permanent water distribution piping for the work undertaken on the system as shown on the Plans, as specified herein and as directed by the Engineer.
- C. The work also shall consist of one (1) connection to the existing water line in Drake Road in accordance with the specifications, and in close conformity with the lines and grades shown on the plans or established by the Engineer. Unless approved otherwise by the Engineer, valve chambers shall consist of pre-cast concrete units. The contractor may elect to construct cast-in-place units for any of these items, however, he/she will be required to submit shop drawings for said cast-in-place units as described under the submittals section.
- D. All work in this section shall be conducted in accordance with the Town of Arlington specifications.

1.03 SUBMITTALS

- A. It is anticipated that certain existing water mains may have to be shut down in order to complete the work of this Contract. The Contractor shall submit a schedule of anticipated water main shutdowns to the Engineer for approval. In no case shall the water be shut off before 9:00 a.m. and the work must be so arranged that the water service will be restored no later than 4:30 p.m., unless permitted in writing by the Engineer.
- B. Valves and Appurtenances. Submit materials data in accordance with the following:
 - 1. Submit certified drawings for each type of valve.

2. All installation and materials shall be in accordance with the rules, regulations and installation procedures as set forth by BWSC and all local and state building codes, and ANSI/AWWA requirements where applicable.
- C. Furnish documentation of all tests required
- D. The Contractor shall submit shop drawings for all piping, valves, and fittings to be used for water service.
- E. Shop drawing submittals are required for review and approval. Shop drawing submittals shall include details of cast-in-place and precast structural materials and details of interfaces, connections, dimensions, layouts, calculations, and other pertinent data. All shop drawings for cast concrete units shall bear the seal of a Professional Engineer registered in the Commonwealth of Massachusetts.
- F. Valve chambers shall be designed in accordance with the details and contract plans and the 1993 AASHTO Standard Specifications for Highway Bridges and Interim Specifications. The loading conditions for which the valve chamber shall be designed include but are not limited to:
 1. Lateral and vertical earth pressure
 2. Buoyancy
 3. HS20-44 truck loading
 4. Water flow pressure and differential hydrostatic pressure
- G. For analysis of the valve chambers, the method of Moment Coefficients, as outlined in the Portland Cement Association Article, "Rectangular Concrete Tanks", of 1969, or an approved method shall be used.
- H. Certificate of compliance for all precast concrete units shall be submitted to the Engineer.

PART 2 - MATERIALS

2.01 VALVES, PIPING AND APPURTENANCES

- A. General
 1. All materials used for water piping systems shall conform to the current Standards in effect for the Town of Arlington, and the State of Massachusetts.

2.02 WATER SERVICE PIPING

- A. Service lines two 2 inches or smaller shall be copper water tubing, Type K, for underground water service and shall be in accordance with ANSI/AWWA C800, latest issue.
- B. Type K copper tubing material shall be in conformance with ASTM B88.
- C. Water service fittings including couplings and adapters, check valves and service saddles shall be in conformance with ANSI/AWWA C800, "Underground Service Line Valves and Fittings."
- D. Joints in copper tubing shall be made with three-part compression couplings, flared tube fittings, or an approved equal.

2.03 WATER VALVE CHAMBER APPURTENANCES

- A. Shut-off valves shall be 3" resilient seated gate valves.
- B. Waste valve on main line in water valve chamber (for drain down) shall be 125 PSI rating made of solid bronze with aluminum handwheel. Unit will not have threaded connection as it is before backflow protection. Nibco brand or approved equal.
- C. Hose bib connection on discharge side of the vacuum breaker backflow preventer (for general hose use) shall be 125 PSI rating made of solid brass w/ aluminum handwheel and ¾" threaded outlet. Nibco brand or approved equal.

2.04 PRECAST CONCRETE WATER VALVE CHAMBER

- A. Concrete
 - 1. All cement concrete materials shall be in accordance with the provisions shown in Section 321313. The minimum 28-day compressive strength of precast concrete shall be 5000 psi. The minimum 28-day compressive strength of cast-in-place concrete shall be 4000 psi.
- B. Dampproofing

Bituminous dampproofing shall be:

 - 1. Cutback Asphalt: a homogenous blend of asphalt cement and suitable solvent conforming to the requirements of AASHTO M81 (rapid cure) or M82 (medium cure), or
 - 2. Tar: suitable for use in pavement construction and conforming to AASHTO M32, or
 - 3. Other material reviewed and approved by the Engineer.

C. Brickwork

Brick shall be sound, hard, uniformly burned brick regular in shape and size. Brick shall conform to ASTM Designation C32. Grade MS shall be used for walls: Grade SS for inverts and shelves.

D. Cement Concrete Brick and Block

Cement concrete brick and block shall be machine made solid segments conforming to the requirements of ASTM C-139. The minimum compressive strength for five representative units shall be 3000 psi, and for one individual unit 2500 psi (ASTM C-140). Maximum average (5 units) absorption rate shall be 15 percent and the individual absorption of any one sample shall not exceed 17-1/2 percent.

The size of brick furnished shall be 7-3/4 inches long by 3-3/4 inches wide by 2-1/4 inches deep. Cement concrete blocks shall be 8 inches in width. Interior and exterior surfaces shall be parallel or curved to the specified radius. Block length shall be such that only full sections are required to lay one course. Width of top course shall be 8 inch to accommodate frame.

E. Mortar

Mortar for brickwork shall be composed of Type II Portland cement, hydrated lime conforming to ASTM C207 Type S and sand. Sand shall be well graded with no grain larger than will pass a #8 sieve. The volume of sand shall not exceed three times the sum of the volume of cement and lime. In general, the proportions of cement to lime shall be one part cement to 1/2 part lime.

Mortar for concrete masonry shall be composed of one part Type II Portland cement and two parts sand. Sand shall be well graded with no grain larger than will pass a #8 sieve.

Water for mixing shall be potable water.

F. Crushed stone shall conform to the requirements specified under Section 310000.

G. Precast Units

Precast Water Valve Chamber

1. Precast concrete Water Valve chamber shall conform to the ASTM C478 - Latest Edition, with the following exceptions and additional requirements:
 - a. The wall sections shall be not less than six inches thick.
 - b. Type II cement shall be used except as otherwise directed.

- c. Joints between sections shall be made with square (O-ring) rubber gaskets with a suitable groove on the spigot ends and shall conform to the ASTM C443 - Latest Edition.
 - d. Chamber sections shall contain manhole steps accurately positioned and imbedded in the concrete when the section is cast.
 - e. Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees F for a period of not less than 12 hours, or when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements.
 - f. No more than four lift holes may be cast or drilled in any section.
 - g. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the section.
 - h. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
 - i. Each separate chamber shall be monolithically cast, with metal or metal faced forms, as a four sided box section with open bottom. Unit will be designed to fit onto pre-cast base as specified below.
 - j. Each separate cell (top & bottom) shall have a male and/or female shiplap joint with not less than 4" concrete overlap. Any openings shall be kept a minimum of 18" from any joint. The precast concrete shall be placed in the dry.
 - k. Any openings required to connect grates to the precast sections, shall be provided for in the manufacture of the valve chamber, line and frames. Additional reinforcement shall be placed at each opening that is larger than the minimum spacing required for normal reinforcement plus concrete cover. Any gaps in the openings between the chamber sections and any connections thereto shall be filled with a non-shrink grout.
2. Water Valve chamber bases
- a. Chamber bases shall be of the same construction as the pre-cast chamber top as specified above. Dimension of the base section shall conform to the details on the contract drawings.
 - b. Provide pre-molded openings for pipe connections into precast chambers.
 - c. Openings for pipe shall be cast in the base at the required locations during the manufacture of the base.

- H. Frames and covers shall conform to the Halliday Products Model No. SIS2424 with compression spring assist or approved equal.

PART 3 - CONSTRUCTION METHODS

3.01 VALVES AND APPURTENANCES

- A. All material shall be inspected by the Contractor for defects prior to installation. Defective materials shall be immediately removed from the site.
- B. All foreign matter shall be removed from valve openings and seat faces.

3.02 EXCAVATION

- A. The limits of excavation shall generally be six inches (6") beyond the outside face and bottom of the proposed structure. All excavation and backfill shall be incidental to the payment item unless otherwise directed by the Engineer. All excavation in pavement areas shall include the saw cutting of the pavement, at a distance of six inches (6") beyond the excavation limit and at a depth required to allow a temporary four-inch (4") roadway patch prior to the reconstruction of the pavement.
- B. When in the opinion of the Engineer, unsuitable materials including muck must be removed beyond the limits of excavation as described herein, the Contractor shall remove the unsuitable materials to a depth as determined by the Engineer. The excavated unsuitable materials shall be replaced with crushed stone meeting the requirements as specified under Section 31000. The crushed stone shall be placed in 6" lifts and thoroughly compacted.
- C. All pump chambers shall be set on a six inch (6") crushed stone base. The crushed stone shall meet the gradation requirements as specified under the Item "Crushed Stone."
- D. All structures shall be constructed under "dry" weather conditions as determined by the Engineer. The Contractor shall use all pumping and dewatering procedures necessary to ensure that all structures are constructed under dry conditions to the satisfaction of the Engineer.
- E. Unauthorized over depth excavation shall be refilled with compacted Gravel Borrow at the Contractor's expense.

3.03 DEWATERING

- A. At all times during the construction the Contractor shall temporarily provide, place and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavation or trench.

- B. Dewatering devices shall remain in operation to keep the excavation or trench dry until the structure or pipe is completed to such an extent that they will not be damaged.
- C. Dewatering shall be done in accordance with these Specifications, Section 310000.

3.04 CONSTRUCTION SEQUENCE

- A. In order to assure that no pavement patches or utility patches occur in the new pavement overlay, all proposed construction is to take place before placing the bituminous concrete pavement.
- B. In existing pavement areas where new chambers are constructed, the Contractor shall provide a concrete encasement extending twelve inches (12") beyond the structure to form a collar around the structure as described in these specifications.
- C. The Concrete encasement of chamber frames shall include furnishing and placing 4000 psi air entrained 3/4" cement concrete to a minimum depth of six inches (6") as described in these specifications.
- D. The Contractor shall not install any portion of the structure above the existing grade without approval of the Engineer.
- E. No additional compensation shall be made to the Contractor for any materials, equipment or labor required to provide temporary access and protection before completion of the structure.

3.05 PRECAST CONCRETE WATER VALVE CHAMBER

- A. Precast concrete water valve chamber will be set plumb.
- B. Once the top half section has been set in place on the lower section, all joints both inside and outside will be filled with mortar and troweled smooth.

3.06 PLACING CASTINGS

- A. Frame castings shall be set in full mortar beds true to the lines and grades as directed.
- B. Where directed the castings shall be temporarily set at such grades as to provide drainage during the construction.
- C. The castings of structures located within the pavement area shall not be completely set to the established grade until the bottom course of pavement has been laid.
- D. The final setting of all other castings shall be performed at the proper stage of construction as directed.

- E. Cement concrete collars shall be placed around the castings after the final setting as shown on the plans and as directed.

3.07 BRICKWORK

- A. Bricks shall be cleaned and thoroughly wetted, except in cold weather, shortly before they are put into the work, and each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling. Joints between bricks shall not exceed 3/8 inches and shall be pointed on the inside. The outside face of all brickwork in the walls and chimneys shall be plastered with Portland cement mortar. If required, the masonry shall be properly moistened prior to application of the mortar. The thickness of the cement mortar shall be one inch and the mortar shall be carefully spread and thoroughly troweled, leaving a smooth surface. The plaster coat shall extend from the top of brickwork to overlapping the concrete on which the brick rests. After hardening, the mortar shall be checked by tapping for bond and soundness. Unbonded plaster shall be removed and replaced.

3.08 DAMPPROOFING

- A. Exterior walls of precast structures shall be dampproofed with a two-coat coverage to obtain a total application of 5 gallons per 100 square feet. Prior to damp-proofing all hole, cracks or other openings shall be filled with mortar for concrete masonry and allowed to fully cure. Damp-proofing material shall be applied only to dry, thoroughly cleaned surfaces. Application shall not be made during wet weather or when temperatures are inappropriate. Allow initial coat to fully dry before application of a second coat. Allow final coat to fully dry prior to backfilling.

3.09 INSPECTION OF MATERIALS

- A. All pipe and fittings shall be from a single manufacturer.
- B. Inspection of the pipe will be made by the Engineer or representatives of the Town after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though shop drawings may have been accepted as satisfactory. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

3.10 WATER MAIN SHUTDOWNS

- A. Certain existing water mains may have to be shut down in order to complete the Work of this Contract. Prior to shutdown notification, the Contractor shall locate and make a preliminary test of operation of the isolating valves without actually turning the stem more than one revolution. Where these valves cannot be located or are inoperable, backup isolation valves shall be located and tested in a like manner. The Contractor shall make a determined effort to uncover buried valves. Isolating valves shall not be shut down before the Contractor notifies all affected water customers as specified. Where allowed by the Engineer and the

Town of Arlington, the Contractor may delete the preliminary testing and proceed with the notification and shut down.

1. In no case shall the water to a customer be shut off before 9:00 a.m. The Work is to be so arranged that the water service shall be restored no later than 4:30 p.m. Water shall not be shut off on Sundays or holidays, unless permitted in writing by the Town. No water main supplying water services to hydrants or for other fire protection services shall be shut down without adequate temporary facilities and prior permission of the Engineer, and local Fire Department.
2. It shall be the responsibility of the Contractor to supply adequate water at all times to the premises of any water customer which has an existing water service of one inch diameter or larger, or any premises, regardless of the size of service, requiring constant water supply as determined by the Engineer. It shall be the responsibility of the Contractor to furnish all labor, material and equipment to make the necessary connections, to supply water to said premises at all times. The method, manner of doing work, materials and devices used in supplying temporary water service shall be subject to the approval of the Engineer and shall be the responsibility of the Contractor.

3.11 LAYING PIPE AND FITTINGS

- A. All water mains shall be laid with a minimum cover of 5 feet and a maximum cover of 6 feet, unless otherwise shown.
- B. Pipes and fittings shall be subjected to a careful inspection by the Contractor just before installation.
- C. A fitting showing a crack, a fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, and fittings and pipe discovered to be defective, shall be marked as rejected, and removed at once from the Work. Pipe showing a crack may be cut off before the pipe is laid at a point at least 12 inches from the visible limit of the crack provided the remaining portion is perfectly sound as determined by the Engineer.
- D. Each pipe shall be cleared of all excess debris, and dirt before laying.
- E. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipes. Pipe or fittings shall not be dropped.
- F. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.
- G. If a defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in satisfactory manner by the Contractor without additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned

before laying, shall be kept clean until used in the Work, and when laid shall conform to the lines and grades required.

- H. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs. The Contractor shall keep the trench free from water while the pipe is being installed. Fittings in addition to those shown on the Drawings shall be provided, if required, in crossing utilities which may be encountered when opening the trench.
- I. When cutting pipe is required, the cutting shall be done by machine leaving a smooth cut at right angles to the axis of the pipe. Cutting shall be in strict conformance to manufacturer's instructions.
- J. The Contractor shall conduct his work so as to interfere with traffic as little as possible and shall safeguard all streets and traffic thereon.
- K. The construction equipment and materials shall be so placed as to not endanger the work nor obstruct traffic.
- L. The Contractor shall maintain all excavations in proper condition for carrying on the work, and shall perform all bailing, draining or pumping as necessary to keep the excavation free of water.
- M. All work, especially excavation, shall be left for the night in a manner that reduces risk of accident by youths.

3.12 TESTING AND CLEANING

- A. All service and connections shall be tested for strength and tightness before being backfilled; they shall be tested under the normal pressure in the water mains to which they are connected, and any signs of leakage or evidence of failure shall be promptly repaired by the Contractor without additional cost to the owner. The Contractor shall furnish all apparatus, material, and labor for making the tests. The water required for testing will be furnished by the contractor without charge to the Owner.
- B. Remove any sediment deposit which may accumulate and impede the full flow of water.
- C. Service lines shall be chlorinated in accordance with this Section.

3.13 BACKFILLING

- A. Backfilling shall begin as soon as practicable after the pipe has been placed and the pipe joints have been made, but not prior to testing. Backfill material shall be placed simultaneously on both sides of the pipe so that there will be no tendency to displace the alignment of the pipe or structure.
- B. Bedding material shall be sand meeting the requirements as specified under section 310000. The minimum compacted depth of sand below the pipe shall be

6 inches; the sand shall encase the pipe as shown on the Contract Drawings. The sand shall be thoroughly compacted using approved hand operated tampers. Compaction shall be to at least 90 percent maximum density at optimum moisture according to ASTM D-1557.

- C. Backfill material between the bedding material and a plane 12 inches above the top of the pipe shall consist of suitable material with no stones or matter larger than two inches diameter. This backfill material shall be placed and compacted in six inch layers.
- D. Backfill material from a plane 12 inches above the top of the pipe to the surface or to the bottom of any paving system shall consist of suitable excavated material equivalent to gravel borrow with no stones or objects larger than three inches in diameter. Material shall be placed and compacted in six inch layers.
- E. Where the material is to be compacted by mechanical tampers or rolling, the material shall be deposited in layers of not more than 12 inches in depth before compaction. Each layer shall be tamped or rolled as required to obtain a thoroughly compacted mass. Care shall be taken that the material close to the side of the trench is thoroughly compacted. Rolling will not be permitted so close to the pipe that damage to pipe or foundation could occur. To ensure proper compaction by tamping or rolling, the material shall first be wet by sprinkling as directed or approved. However, no compaction shall be done when the material is too wet.
- F. Where sufficient suitable material is not available from the excavation, the Contractor shall provide Common Borrow as specified in section 310000.
- G. Frozen material shall not be placed in the backfill, nor shall backfill be placed on frozen material.

3.14 CHLORINATION OF PIPELINES

- A. Upon completion of the permanent pipeline system and all the testing thereof, the interior of the pipe shall be flushed and then thoroughly disinfected in all parts. This disinfection must result in eliminating from the various parts of the new pipeline all evidence of the existence of bacteria indicative of any contamination, as determined by tests of the bacterial content of samples of water taken from the new water line. The test results shall be submitted by the Contractor to the Town of Arlington and the Owner's Representative for review. The disinfection may be accomplished by introducing into all the various parts of the new water lines a liquid solution containing one percent available chlorine in such volume that the rate of dosage to the water lines shall be at least 50 parts per million of available chlorine. The contact period for this disinfection shall be at least twenty-four hours, and a longer period will be required if tests of residual chlorine show it to be necessary to proper disinfection.
- B. The water system shall be flushed out after its disinfection. The Contractor shall furnish and install suitable temporary testing plugs, caps, pumps, pipe connections and other appurtenances as required for disinfecting the water lines.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE SYSTEM

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Site storm drainage system, subdrains, and temporary drainage facilities.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for all products required to complete the work of this section.
- B. Shop Drawings: Submit detailed shop drawings for the following:
 - 1. Water quality inlet structures, (showing dimensions, reinforcement etc.).
 - 2. Trench drains showing length, invert elevations, etc.
- C. Record Documents:
 - 1. Submit one reproducible of As-Built Drawings upon completion and acceptance of work.
 - 2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction.
 - 3. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall include a minimum of three ties showing the distance to each catch basin and manhole from fixed permanent objects. As-Built drawings shall also contain any additional information required by the municipality.
 - 4. As-Built Drawings shall be stamped by a Professional Land Surveyor or Professional Engineer.

1.04 QUALITY ASSURANCE

- A. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.

- B. Codes and Standards: work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
- C. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- D. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before installing items specified.

1.05 PROJECT CONDITIONS

- A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during, and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's Representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.
- B. The Contractor shall remove all debris, construction equipment, and waste material from areas within the limit of work prior to inspection for acceptance.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and supplies to the job adequately protected from damage during transit.
- B. Store products and supplies off the ground and protected against damage. Damaged products and/or supplies will be rejected and shall not be employed in the work.

1.07 COORDINATION

- A. Coordinate the work with the termination of storm sewer connections outside buildings, connection to municipal sewer system and trenching operations.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All materials for storm drainage system shall be new and unused. All materials shall meet Municipal Standards.

2.02 STORM DRAIN PIPING

- A. High Density Corrugated Polyethylene Pipe and Fittings: ASTM D3350 smooth interior. (AHancor >HI-Q= pipe@ or ADS N-12 approved equal). Four-Inch

through 10-inch diameter pipe shall meet specification for polyethylene drainage tubing per AASHTO M252. 12 inch through 31 inch diameter pipe shall meet specification for corrugated polyethylene pipe per AASHTO M294, Type S. Standard 45 Degree AY@ Connections shall be fabricated to sizes shown on the plans.

- B. Filter Fabric for Underdrains: Mirafi 140N.
- C. Pipe joints shall be integrally molded bell ends in accordance with ASTM D3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

PART 3 – EXECUTION

3.01 PIPE INSTALLATION

- A. As soon as the excavation is completed to the normal grade of the bottom of the trench, the Contractor shall immediately place the bedding material in the trench. Then the pipe shall be firmly bedded in the compacted bedding material to conform accurately to the lines and grades indicated on the Drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions.
- C. Notch under pipe bells and joints, where applicable to provide for uniform bearing under entire length of pipe.
- D. Excavation, backfilling and compaction shall be as specified in Section 02200 of these Specifications.
- E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.02 CLEANING

- A. At the completion of the work, clean all piping, structures, as well as open drainage courses through and to which water from this construction is directed to the satisfaction of the Owner's Representative.

END OF SECTION

SECTION 33 47 26
BIORETENTION AREAS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 – General Requirements as part of this section.

1.02 RELATED DOCUMENTS

- A. AASHTO T 194 Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion.
- B. ASTM D 4972 Standard Test Method for pH of Soils.
- C. ASTM D 422-63 Standard Test Method for Particle-Size Analysis of Soils.
- D. ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- E. ASTM D 1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.03 SUMMARY

- A. This Section includes the following:
 - 1. Testing, mixing, and installation of topsoil material in conjunction with a Rain Garden/Bioretention Area installation.
- B. Related Sections include the following:
 - 1. Division 2 Section "Site Preparation" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 2 Section "Earthwork "
 - 3. Division 2 Section "Loaming and Seeding/Sodding" for seeding.
 - 4. Division 2 Section "Planting" for planting.

1.04 DEFINITIONS

- A. Rain Garden Amended Topsoil: Topsoil that has been uniformly modified with soil amendments to meet the requirements of this section and designed to readily in-

filtrate runoff water down to either open graded stone layer or subgrade below.

- B. Rain Garden/Bioretention Area: Shallow vegetated depression whose topsoil is composed of amended topsoil that may or may not be underlain with open graded stone.

1.05 SUBMITTALS

- A. Erosion Control Blanket
- B. Amended Bioretention Area Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory or a recognized commercial or governmental agency such as University of Massachusetts extension services:
 - 1. Analysis shall state percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 2. Report suitability of amended topsoil for Perennial Herbs and Flowers growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory amended topsoil.

1.06 QUALITY ASSURANCE

- A. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

PART 2 - PRODUCTS

2.01 EROSION CONTROL BLANKET

- A. Erosion Control Blanket shall be BioNet S75BN lightweight biodegradable single-net straw erosion control blanket as supplied by Western Green, (800) 772-2040, www.nagreen.com, or approved equal.

2.02 RAIN GARDEN AMENDED TOPSOIL

- A. Refer to 'Amended Topsoil' as described in Specification Section 32 18 24 Athletic Fields.

PART 3 - EXECUTION

3.01 BIORETENTION AREA SOIL EXCAVATION

- A. Excavation shall be achieved via backhoe or other similar excavation equipment that shall be situated outside the boundary of the bioretention area. If the bioretention area scale is too large to accommodate this requirement, use low ground pressure excavation equipment, which shall be confined to a "one-track" alignment within the bioretention area to accomplish the excavation, placement of the amended soil, or reapplication of topsoil into the bioretention area basin.

3.02 SUBGRADE INSPECTION

- A. Notify Owner Representative when excavations have reached required subgrade.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner Representative, without additional compensation.

3.03 STORAGE OF SOIL MATERIALS

- A. Stockpile amended soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile amended soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.04 BIORETENTION AREA SOIL PLACEMENT

- A. Installation of amended topsoil must be done in a manner that will ensure adequate infiltration. Scarify rough grades for bioretention gardens. Place amended soil mix in 6" -12" lifts. Lifts shall be compacted as described below. Overfill above the proposed final grade to accommodate natural settlement to meet finish grades. Do not spread if amended soil or subgrade is frozen, muddy, or excessively wet.
- B. Light Compaction of Amended Topsoil Soil. Avoid over compaction by allowing time for natural settlement and compaction. Amended Topsoil shall have a maximum dry density of 70% (ASTM D 1557) or 75% (ASTM D 698) after completion of the Bioretention Area installation. If time does not allow for natural settlement of soil, light compaction methods as specified below, may be implemented; if needed, additional amended soil mix shall be placed as previously stated to meet final grades.
 - 1. Amended Topsoil mix may be compacted by presoaking the placed soil until water flows from an underdrain (if present). Water for saturation shall be applied by spraying or sprinkling. Additional settlement may occur subsequent to the initial wetting.
 - 2. Roll the entire bioretention area with a hand roller weighing no more than 100 pounds per foot of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional amended bioretention

area soil mix and the surface shall be re-graded and rolled until a smooth and even finish to the required grade is achieved.

- C. If amended soil becomes contaminated by construction site runoff during the construction of the facility, the contaminated material shall be removed and replaced with uncontaminated material at no additional cost to the Owner.
- D. Contractor shall place construction fencing or other approved barriers to prevent compaction of amended bioretention area soil mix from vehicle, equipment, or foot traffic.
- E. Amended topsoil in accordance with paragraph 2.02 shall be placed in the locations indicated to a minimum depths indicated in the drawings after compaction.
- F. Amended topsoil and topsoil shall be compacted to 80 – 85 percent according to ASTM D 1557 and additional material placed and compacted to meet indicated grades and elevations.

3.05 FINE GRADING

- A. Carefully prepare the amended bioretention area soil bed by scarifying and hand raking after amended soil mix has been spread.

3.06 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

3.07 VEGETATION COVER

- A. Permanent seed matrix installation shall be conducted during installation seasons normally recognized in the job locality for the native species that are proposed, and shall be approved by the Design Professional. Refer to Seeding Specification.
- B. Plant live material after seeding and placement of erosion control blanket. Contractor will be required to carefully slit installed erosion control blanket for live plug and container installation. Contractor shall ensure minimal disturbance to the erosion control blanket. Refer to Planting Specification.

3.08 EROSION CONTROL BLANKET

- A. Install per manufacturer's recommendations.

END OF SECTION

SECTION 34 71 13.13
WOOD GUARDRAIL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Wood Guardrail
 - 2. No Mow Sign
 - 3. Wooden Bollard

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Earthwork
- B. Planting

1.04 REFERENCES

- A. Work shall conform to codes and standards of the following:
 - 1. Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (MassDOT Specifications).

1.05 QUALITY ASSURANCE

- A. Sample section: Construct a sample section of each item specified herein, for approval, before beginning the work of this Section.
 - 1. Sample section shall exhibit typical materials, jointing, and workmanship.
 - 2. Sample section shall be approximately one section long.
 - 3. Sample section shall be inspected by the Landscape Architect. If not acceptable construct additional sections until an acceptable section is constructed. Accepted panel shall become the standard for the entire job and shall remain undisturbed until the completion of work.

- B. The work of this section shall be completely coordinated with the work of the other Sections. Verify dimensions and work of other trades adjoining materials of this Section before installing items specified.
- C. Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely with the specified requirements and methods needed for proper performance of the work of this Section.

1.06 SUBMITTALS

- A. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of all parts of the work under this Section.
- B. Product Information: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wood Guardrail/No Mow Sign/ Wooden Bollard
 - 1. Guardrail posts, rails and offset blocks shall be northern white cedar, rough sawn to the dimensions shown on the Drawings.
 - 2. All posts shall be treated with an approved wood preservative all sides for a dimension of 3'-0" from the butt of the post.
 - 3. Posts shall be extended to maintain a minimum of 3'-0" in ground to accommodate any changes in grade.
 - 4. All metal hardware shall be hot dipped galvanized.

PART 3 - EXECUTION

3.01 WOOD GUARDRAIL:

- A. Install guardrail as detailed. Posts shall be installed plumb; rails shall be installed parallel to finish grade.

END OF SECTION

APPENDIX A

GEOTECHNICAL REPORT

GEOTECHNICAL REPORT

**ARLINGTON LIGHT POLE FOUNDATIONS
25 DRAKE ROAD
ARLINGTON, MASSACHUSETTS**

November 19, 2021

GSI Project No. 221244

Prepared for:

Mr. Joe Connelly
Town of Arlington, Massachusetts
422 Summer Street
Arlington, MA 02474

Prepared by:

Harry K. Wetherbee, P.E.
Geotechnical Services, Inc.
55 North Stark Highway
Weare, NH 03281

November 19, 2021

Mr. Joe Connelly
Town of Arlington, Massachusetts
422 Summer Street
Arlington, MA 02474

**RE: Geotechnical Report
Arlington Light Pole Foundations
25 Drake Road
Arlington, Massachusetts**

GSI Project No. 221244

This report presents the results of a geotechnical investigation completed by Geotechnical Services, Inc. (GSI) for the construction of the proposed lighting towers to be located at the athletic field at 25 Drake Road in Arlington, Massachusetts. The objective of the geotechnical investigation was to explore subsurface conditions within the proposed development area and formulate geotechnical engineering recommendations for the design and construction of the proposed light pole foundations. Included are the findings of our subsurface exploration program and an engineering evaluation of the subsurface conditions encountered. The contents of this report are subject to the **Limitations** included in Appendix A.

PURPOSE AND SCOPE

The scope of services performed by GSI to meet the above-stated objectives for geotechnical engineering services included the following:

1. Coordination and observation of four (4) test borings at the locations illustrated on the attached Figure 2.
2. Preparation of recommendations for spread footing foundation support of the proposed towers, including estimated bearing capacities and settlement values.
3. Preparation of general recommendations for earthwork and foundation construction procedures to be followed during the construction phase of this project.
4. Preparation of recommendations regarding seismic considerations for the site surficial materials and the proposed development.
5. Preparation of this geotechnical engineering report which summarizes our findings and recommendations.

SITE AND PROJECT INFORMATION

The project includes development includes the construction of three new lighting towers at Hurd Field, located at 25 Drake Road in Arlington, Massachusetts. The site is abutted by the Minuteman Commuter Bikeway to the south, Drake Village residences to the west, Colonial Village to the east, and Arlington Reservoir Recreational Area to the north with Hurd Pond beyond.

The property consists of a large open athletic field utilized for multiple sports. The field will be reconstructed in the near future. Prior to the new field installation, a series of new lighting fixtures will be installed. It is assumed that the fixtures will be of similar construction to the lighting currently existing at the field, and that the lights will be supported by free standing steel monopoles founded upon cylindrical or spread concrete footings.

SUBSURFACE INVESTIGATION

Four (4) test borings designated GSI-1 through GSI-3A advanced for the purpose of evaluating the geotechnical properties of the existing soils. The test boring was advanced at the lighting locations to depths of 5 to 19 feet below existing grade. The subsurface explorations classified the on-site soils according to their color, grain size, and other material properties. The test boring program was conducted by Technical Drilling Services, Inc. of Sterling, Massachusetts utilizing a track mounted drill rig with cased “wash and drive” drilling techniques.

Soil explorations were performed in accordance with methods prescribed by ASTM D1586. Soil samples were obtained at the surface and at two to five-foot intervals with a 1½ inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in accordance with ASTM D1586. Field descriptions of the soils encountered, observed depth to groundwater while drilling when observed, and other pertinent observations are contained in the attached test boring log. The test boring location is illustrated on Figure 2 of this report. The GSI test boring log is presented in Appendix B.

SUBSURFACE CONDITIONS

Topsoil

The subsurface explorations were advanced within an existing athletic field and 2 to 8 inches of topsoil was observed at ground surface overlying a dark brown, fine to medium Sand, some Silt, trace Gravel, with roots.

Sand

Sand was present at test boring locations GSI-1 and GSI-2 from the initial sampling interval to depths of 5 to 10 feet below grade, and consisted of loose to medium dense, brown or gray, fine to medium Sand, trace to little Silt, trace Gravel. SPT “N” values varied from 7 to 14 blows per foot.



Sand and Gravel

Sand and Gravel was encountered at all four test boring locations 5 to 10 feet below grade, and was classified as very dense gray or brown, Gravel, and fine to coarse Sand, trace to little Silt. SPT “N values of 61 to over 100 blows per foot were obtained within the Sand and Gravel, which continued to test boring refusal/termination at depths of 5 to 19 feet.

Refusal/Bedrock

Test boring refusal was encountered at depths of 5 to 19 feet below grade. It is assumed that some of the refusals may be a result of cobbles and boulders. Many large boulders were visible along the perimeter of the field, within the street bed, and along the banks of the adjacent stream. Refusal is defined as the inability of the casing or roller bit to advance despite increasing torque and downward pressure applied by the drill rig. Split spoon refusal is defined as either 100 blows or more required to drive the split spoon sampler 12 inches with a 140-lb. hammer falling 30 inches; 50 blows for less than 6 inches of advancement; or 10 blows with no discernable, vertical movement of the split spoon sampler.

GROUNDWATER

Groundwater was encountered at depths of 3 to 4 feet during the advancement of the test boring. Groundwater observations should not be considered long-term, equilibrated groundwater levels, but rather an approximate indication of the likely groundwater elevation during construction. Groundwater levels should be anticipated to fluctuate from those measured during drilling operations in response to differences in equilibrated time, rainfall, snowmelt, and seasonal changes.

FOUNDATION DESIGN RECOMMENDATIONS

GSI recommends that the proposed lighting towers be supported by cylindrical or reinforced concrete mat footings bearing directly upon the native Sand or Sand and Gravel soils. An allowable bearing pressure of 2 tons per square foot (4,000psf) may be utilized for design. The footings must also be proportioned to resist overturning moment. The footings should also be founded at least 4 feet below exterior grade per local building regulations to obviate frost action in the bearing strata.

At the recommended bearing pressures, we anticipate that the total settlement of individual footings under static loading conditions and constructed as recommended herein, will not exceed 1 in., with differential settlements between adjacent footings not exceeding $\frac{3}{4}$ in. Most of the settlement will likely occur elastically during construction as structure dead loads are placed on the foundations. The live load contribution to foundation settlement is expected to be less than 50% of the dead load thus post construction settlements are not expected to be problematic.



ENGINEERING PARAMETERS OF ON-SITE SOILS

Based on results of our subsurface exploration program, the following engineering properties of soil and rock that will be supporting foundation elements are estimated as follows:

TABLE ONE SOIL ENGINEERING DESIGN PARAMETERS				
Soil Type	Friction Angle ϕ , (degrees)	Cohesion c , (psf)	Unit Weight γ , (pcf)	Coeff. of Sliding Friction Soil to Concrete ($\tan \delta$)
Sand and Gravel	32	0	125	0.40

SEISMIC DESIGN PARAMETERS

The seismic design parameters have been reviewed with respect to the 9th Edition of the Massachusetts Building Code. Upon review of the subsurface soils data, the site is to be associated with Site Class "C" and the design of structural elements should reflect this distinction. The subsurface conditions are also not deemed susceptible to earthquake induced "liquefaction." A Summary of USGS Design Maps are included as Appendix D.

EARTHWORK RECOMMENDATIONS

Foundation Subgrade Preparation

Prior to foundation construction, any topsoil or subsoil encountered within the tower foundation footprint and foundation zone of influence should be removed and footings shall bear upon an undisturbed subgrade of the native soils described above. Boulders that protrude above subgrade shall be removed and the ensuing cavity replaced with compacted structural fill or crushed stone.

Protection of Foundation Subgrades

If constructed on soil, the contractor should be required to maintain a stable, dewatered subgrade for the tower foundations. Subgrades may be disturbed by improper excavation methods, moisture, precipitation, groundwater control, and construction activities. The contractor should take precautions to protect the bearing subgrade against disturbance from construction traffic and weathering. If necessary, dewatering can be accomplished via open pumping utilizing submersible pumps and temporary stone lined sump pits.



A lift of compacted crushed stone is recommended to protect the subgrade surface from wear and disturbance should water be present within the excavation. The subgrade must still be verified for competency prior to the placement of concrete or backfill materials within the tower footprint. If construction activities are to take place during winter months, the contractor should protect the work area from freezing, which may necessitate the use of soil blankets or tents and heaters to protect the subgrade surface.

Construction Dewatering

The site contractor should be prepared to remove any standing water from foundation excavations. Stormwater runoff developed from storm events should be diverted away from excavation areas to minimize any impoundment in the excavation or disturbance to the foundation subgrades. It is anticipated that groundwater and stormwater may be controlled by localized dewatering efforts employing sumps and pumps. The groundwater elevation should be maintained at least 12 inches below the foundation grade until backfilling is complete.

Temporary Earth Support

The on-site soils are considered as Type “C” soils based on OSHA Standard 29 CFR 1926. It is assumed that the subgrade excavation may be accomplished via open cut techniques. Temporary excavation support systems if required, are typically designed or subcontracted by the contractor, must be stamped by a professional engineer registered within the Commonwealth of Massachusetts, and submitted to the architect/owner’s representative for review and approval prior to construction. Excavation support design and implementation must also meet OSHA excavation safety requirements.

CONSTRUCTION MONITORING

It is recommended that a qualified geotechnical engineer be retained to observe subgrade preparation and foundation construction in conformance with the requirements of local building codes. GSI has the geotechnical personnel trained and experienced in monitoring earthwork excavation and testing, as well as a full-service Soils and Materials laboratory.



CLOSURE

We trust that you find this report consistent with your needs. Should you have any questions with regard to this report, please do not hesitate to contact our office.

Very truly yours,

GEOTECHNICAL SERVICES, INC.

Harry K. Wetherbee, P.E.
Principal Engineer

Attachments:

Figure 1: Locus Plan

Figure 2: Boring Location Plan

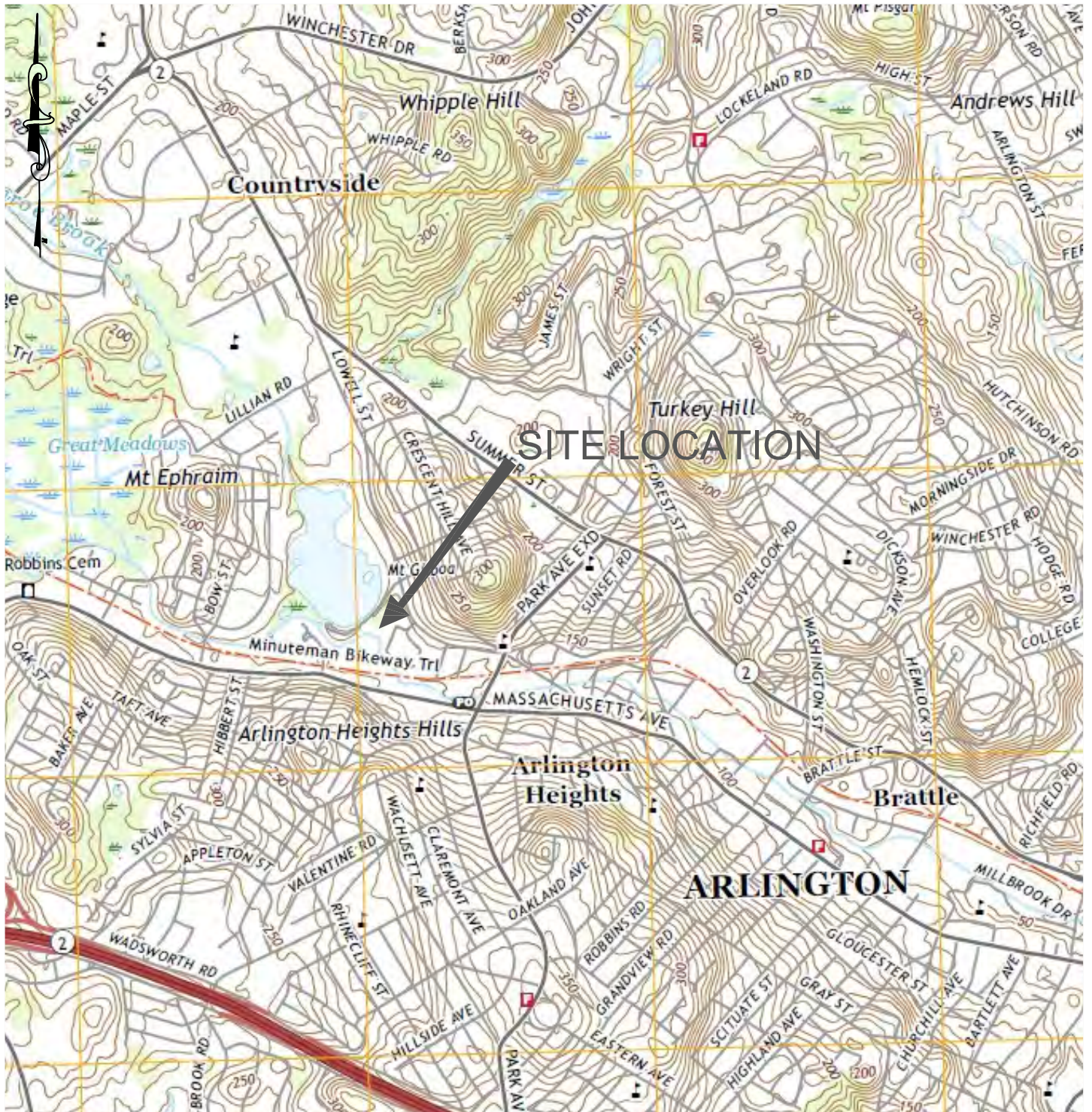
Appendix A: Limitations

Appendix B: Exploration Logs

Appendix C: Subsurface Exploration Key

Appendix D: USGS Seismic Design Maps





LOCUS MAP



GEOTECHNICAL SERVICES INC.

55 NORTH STARK HIGHWAY, WEARE, NH 03281
TEL. (603) 529-7766 FAX. (603) 529-7780

Arlington Light Pole Foundations Arlington, Massachusetts

DRAWN BY: KJM

DATE: November 2021

CHECKED BY: HKW


SCALE: 1" = @1500'

FILE NAME:
Arlington Light Pole.dwg

PROJECT NO.: 221244

FIGURE NO. 1



 **GSI-1** GSI Test Boring Location (Approximate)

<p>EXPLORATION LOCATION PLAN</p>	<div> </div> <div> <p>GEOTECHNICAL SERVICES INC. 55 NORTH STARK HIGHWAY, WEARE, NH 03281 TEL. (603) 529-7766 FAX. (603) 529-7780</p> </div>		
<p>Arlington Light Pole Foundations Arlington, Massachusetts</p>	<p>DRAWN BY: KJM</p>	<p>DATE: November 2021</p>	<p>FIGURE NO. 2</p>
	<p>CHECKED BY: HKW</p>	<p>SCALE: NTS</p>	
	<p>FILE NAME: Arlington Light Pole.dwg</p>	<p>PROJECT NO.: 221244</p>	

APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses, recommendations, and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Geotechnical Services, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of the above and their assigns, in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
8. This report has been prepared for this project by Geotechnical Services, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation considerations only.



APPENDIX B

EXPLORATION LOGS



TEST BORING LOG

Boring No.

GSI-1

Page 1 of 1

Project	Arlington Light Pole Found.		GSI Project No.	221244	Elevation	Existing Grade
Location	Arlington, Massachusetts		Project Mgr.	Harry Wetherbee	Datum	-
Client	Town of Arlington, MA		Inspector	Kevin Maynard	Date Started	11/17/2021
Contractor	NEB		Checked By	Harry Wetherbee	Date Finished	11/17/2021
Driller	Jim S.		Rig Make & Model	Stratostar 5		
Item:	Auger	Casing	Sampler	Core Barrel	<input type="checkbox"/> Truck <input checked="" type="checkbox"/> Track <input type="checkbox"/> Bomb. <input type="checkbox"/> Tripod	<input type="checkbox"/> Skid <input type="checkbox"/> ATV <input type="checkbox"/> Geoprobe <input type="checkbox"/> Other
Type		CAS	SS		Hammer Type: <input type="checkbox"/> Safety Hammer <input type="checkbox"/> Doughnut <input checked="" type="checkbox"/> Automatic	
Inside Diameter (in.)		4"	1-3/8"			
Hammer Weight (lb)			140			
Hammer Fall (in.)			30"		<input type="checkbox"/> Winch <input checked="" type="checkbox"/> Cat Head <input type="checkbox"/> Roller Bit <input checked="" type="checkbox"/> Cutting Head	

Depth (ft)	Casing (Blows/ft)	Sample Data						Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
		No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	PID Rdg. (ppm)		
0		S-1	0-2	12	2 6 8 3	14			3" Topsoil over medium dense, dark brown, fine to medium Sand, little to some Silt, trace Gravel Last 2" consisted of light brown, fine to medium Sand, little Silt
5		S-2	5-7	18	16 28 40 45	68			Very dense, brown, Gravel, and fine to coarse Sand, trace Silt
10		S-3	10-12	0	30 75 50/1"	100+			No recovery, assumed Gravel with cobbles and boulders Test boring refusal at 10 feet Test boring terminated at 10 feet
15									
20									

Water Level Data				Sample Identification		Cohesive Soils N-Value	Granular Soils N-Value
Date	Time	Depth (ft) to:		O = Open Ended Rod	0 to 2: Very Soft	0 to 4: Very Loose	
		Bott. of Casing	Bott. of Hole	U = Undisturbed	2 to 4: Soft	4 to 10: Loose	
11/17	E.O.D.		10'	S = Split Spoon	4 to 8: Medium Stiff	11 to 30: Medium Dense	
				C = Rock Core	8 to 15: Stiff	31 to 50: Dense	
				G = Geoprobe	15 to 30 Very Stiff	Over 50: Very Dense	
					Over 30: Hard		

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)				GSI-1
Notes:				

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Phone 603/529-7766 Fax 603/529-7080 - 30 Newbury St. 3rd Floor, Boston, MA 02116 Phone 617/455-4248 Fax 617/745-4308



TEST BORING LOG

Boring No.

GSI-2

Page 1 of 1

Project	Arlington Light Pole Found.		GSI Project No.	221244	Elevation	Existing Grade
Location	Arlington, Massachusetts		Project Mgr.	Harry Wetherbee	Datum	-
Client	Town of Arlington, MA		Inspector	Kevin Maynard	Date Started	11/17/2021
Contractor	NEB		Checked By	Harry Wetherbee	Date Finished	11/18/2021
Driller	Jim S.		Rig Make & Model	Stratostar 5		
Item:	Auger	Casing	Sampler	Core Barrel	<input type="checkbox"/> Truck <input checked="" type="checkbox"/> Track <input type="checkbox"/> Bomb. <input type="checkbox"/> Tripod	<input type="checkbox"/> Skid <input type="checkbox"/> ATV <input type="checkbox"/> Geoprobe <input type="checkbox"/> Other
Type		CAS	SS		Hammer Type: <input type="checkbox"/> Safety Hammer <input type="checkbox"/> Doughnut <input checked="" type="checkbox"/> Automatic	
Inside Diameter (in.)		4"	1-3/8"			
Hammer Weight (lb)			140			
Hammer Fall (in.)			30"		<input type="checkbox"/> Winch <input checked="" type="checkbox"/> Cat Head	<input type="checkbox"/> Roller Bit <input checked="" type="checkbox"/> Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data						Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
		No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	PID Rdg. (ppm)		
0		S-1	0-2	18	2 4 3 4	7			8" Topsoil over loose, dark brown, fine to medium Sand, little to some Silt, trace Gravel
5		S-2	5-7	15	4 6 8 15	14			Medium dense, gray, fine to coarse Sand, trace to little Silt, trace Gravel
10		S-3	10-12	20	18 36 25 27	61			Very dense, gray, fine to coarse Sand, little to some Gravel, trace Silt
15		S-4	15-17	12	23 33 37 40	70			Very dense, gray, fine to coarse Sand, some Gravel, little Silt
20									Test boring refusal at 18.5 feet Test boring terminated at 18.5 feet

Water Level Data				Sample Identification		Cohesive Soils N-Value		Granular Soils N-Value	
Date	Time	Depth (ft) to:		O = Open Ended Rod	0 to 2: Very Soft	0 to 4: Very Loose			
		Bott. of Casing	Bott. of Hole	U = Undisturbed	2 to 4: Soft	4 to 10: Loose			
11/17	E.O.D.		18.5'	S = Split Spoon	4 to 8: Medium Stiff	11 to 30: Medium Dense			
				C = Rock Core	8 to 15: Stiff	31 to 50: Dense			
				G = Geoprobe	15 to 30 Very Stiff	Over 50: Very Dense			
					Over 30: Hard				

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)				GSI-2
Notes:				



TEST BORING LOG

Boring No.

GS|-3

Page 1 of 1

Project			Arlington Light Pole Found.			GSI Project No.			221244			Elevation			Existing Grade		
Location			Arlington, Massachusetts			Project Mgr.			Harry Wetherbee			Datum			-		
Client			Town of Arlington, MA			Inspector			Kevin Maynard			Date Started			11/18/2021		
Contractor			NEB			Checked By			Harry Wetherbee			Date Finished			11/18/2021		
Driller			Jim S.			Rig Make & Model			Stratostar 5								
Item:		Auger		Casing		Sampler		Core Barrel		<input type="checkbox"/> Truck <input checked="" type="checkbox"/> Track <input type="checkbox"/> Bomb. <input type="checkbox"/> Tripod		<input type="checkbox"/> Skid <input type="checkbox"/> ATV <input type="checkbox"/> Geoprobe <input type="checkbox"/> Other		Hammer Type: <input type="checkbox"/> Safety Hammer <input type="checkbox"/> Doughnut <input checked="" type="checkbox"/> Automatic			
Type				CAS		SS											
Inside Diameter (in.)				4"		1-3/8"											
Hammer Weight (lb)						140											
Hammer Fall (in.)						30"				<input type="checkbox"/> Winch <input checked="" type="checkbox"/> Cat Head		<input type="checkbox"/> Roller Bit		<input checked="" type="checkbox"/> Cutting Head			
Sample Data									Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)								
Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)									
0		S-1	0-2	16	5 7 12 22	19			3" Topsoil over medium dense, dark brown, fine to medium Sand, little to some Silt, trace Gravel with roots and organics Last 6" consisted of brown, fine to medium Sand, little Gravel. trace Silt								
5		S-2	5-7	5	100/5"	100+			Very dense, brown, Gravel, and fine to coarse Sand, trace to little Silt Test boring refusal at 5.5 feet Test boring terminated at 5.5 feet								
10																	
15																	
20																	
Water Level Data									Sample Identification			Cohesive Soils N-Value			Granular Soils N-Value		
Date		Time	Depth (ft) to:		Bott. of Casing	Bott. of Hole	Water	O = Open Ended Rod U = Undisturbed S = Split Spoon C = Rock Core G = Geoprobe			0 to 2: Very Soft 2 to 4: Soft 4 to 8: Medium Stiff 8 to 15: Stiff 15 to 30: Very Stiff Over 30: Hard			0 to 4: Very Loose 4 to 10: Loose 11 to 30: Medium Dense 31 to 50: Dense Over 50: Very Dense			
11/17		E.O.D				5.5'	4'										
Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)																	
Notes:															GSI-3		



TEST BORING LOG

Boring No.

GSI-3A

Page 1 of 1

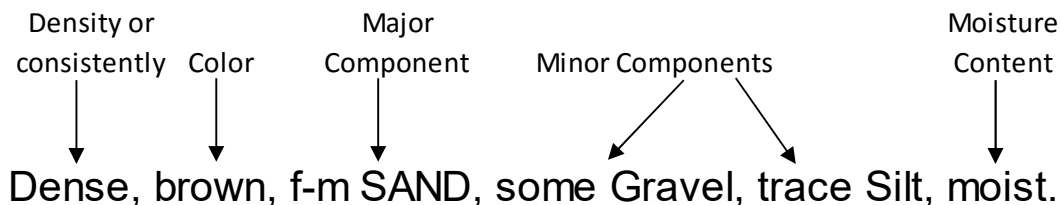
Project		Arlington Light Pole Found.		GSI Project No.		221244		Elevation		Existing Grade							
Location		Arlington, Massachusetts		Project Mgr.		Harry Wetherbee		Datum		-							
Client		Town of Arlington, MA		Inspector		Kevin Maynard		Date Started		11/18/2021							
Contractor		NEB		Checked By		Harry Wetherbee		Date Finished		11/18/2021							
Driller		Jim S.		Rig Make & Model		Stratostar 5											
Item:		Auger		Casing		Sampler		Core Barrel		<input type="checkbox"/> Truck <input checked="" type="checkbox"/> Track <input type="checkbox"/> Bomb. <input type="checkbox"/> Tripod							
Type				CAS		SS				<input type="checkbox"/> Skid <input type="checkbox"/> ATV <input type="checkbox"/> Geoprobe <input type="checkbox"/> Other							
Inside Diameter (in.)				4"		1-3/8"				Hammer Type: <input type="checkbox"/> Safety Hammer <input type="checkbox"/> Doughnut <input checked="" type="checkbox"/> Automatic							
Hammer Weight (lb)						140											
Hammer Fall (in.)						30"				<input type="checkbox"/> Winch <input checked="" type="checkbox"/> Cat Head <input type="checkbox"/> Roller Bit <input checked="" type="checkbox"/> Cutting Head							
Sample Data									Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)								
Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)									
0									Test boring refusal at 5.25 feet Test boring terminated at 5.25 feet								
5																	
10																	
15																	
20																	
Water Level Data									Sample Identification			Cohesive Soils N-Value			Granular Soils N-Value		
Date	Time	Depth (ft) to:							O = Open Ended Rod U = Undisturbed S = Split Spoon C = Rock Core G = Geoprobe	0 to 2: Very Soft 2 to 4: Soft 4 to 8: Medium Stiff 8 to 15: Stiff 15 to 30: Very Stiff Over 30: Hard			0 to 4: Very Loose 4 to 10: Loose 11 to 30: Medium Dense 31 to 50: Dense Over 50: Very Dense				
		Bott. of Casing	Bott. of Hole	Water													
11/17	E.O.D.		5.25'	4'													
Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)																	
Notes:																	
GSI-3A																	

APPENDIX C

SUBSURFACE EXPLORATION KEY

FIELD DESCRIPTION AND CLASSIFICATION OF SOIL - Burmister System

Soil descriptions indicated on the test boring logs are based on Standard Penetration Test (SPT) results and observation of the soil samples obtained. Soil samples generally described and classified as illustrated in the following example:



- 1.0 DENSITY OR CONSISTENCY – The density or consistency is determined from the Standard Penetration Test (ASTM 1586), which corresponds to the number of blows required to drive a standard 2-inch outside diameter split-spoon sampler from the 6 to 18-inch depth of a 24-inch sample using a 140-pound weight falling freely for 30 inches.

Density of Granular Soil	Penetration Resistance (N-blows/ft)		Consistency of Composite Clay Soil
Very Loose	0 - 4	< 2	Very soft
Loose	4 - 10	2 - 4	Soft
Medium Dense	10 - 30	4 - 8	Medium soft
Dense	30 - 50	8 - 15	Stiff
Very Dense	> 50	15 - 30	Very stiff
		> 30	Hard

- 2.0 COLOR – Visual

- 3.0 SOIL COMPONENTS – The description and classification is based on the following criteria.

- 3.1 DESCRIPTION – The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample.

Major Component – The major component (>50%) is written with upper case letters for granular soil (SAND, GRAVEL), and a combination of upper and lower case letters for composite soil (Silty CLAY, Clayey SILT).

Minor Component – The minor soil components (≤50%) are written with the first letter of each material in upper case, and the remaining letters in lower case (Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Description	Percentage
and	35 - 50%
some	20 - 35%
little	10 - 20%
trace	0 - 10%

Other Components – The other components within the soil which may be encountered include glass, bricks, trash, etc. The other components are identified and follow the major and minor soil components.

3.2 CLASSIFICATION

Granular Soil by Sieve Size – A granular soil sample is classified by visually estimating the particle size as referenced to a Standard Sieve.

<u>Material*</u>	<u>Standard Sieve Limit</u>	
	<u>Upper</u>	<u>Lower</u>
GRAVEL - coarse	3-inch	3/4-inch
- fine	3/4-inch	No. 4
SAND - coarse	No. 4	No. 10
- medium	No. 10	No. 40
- fine	No. 40	No. 200
SILT	No. 200	

Granular Soil by Visual Identification

<u>Material</u>	<u>Visual ID</u>
Silts and Clays	Too small to see.
Fine Sand	Finest visible grain.
Medium Sand	1/64" to 1/16"
Coarse Sand	1/16" to 1/4"
Fine Gravel	1/4" to 3/4"
Coarse Gravel	3/4" to 3"
Cobbles	3" to 6"
Boulders	Greater than 6"

*The Gravel/Sand portions of a granular soil are further divided based on the following proportions:

<u>Gravel/Sand</u>	<u>Proportion</u>
fine to coarse	> 10% all factions
coarse	< 10% fine and medium
medium to coarse	< 10% fine
medium	< 10% fine and coarse
fine to medium	< 10% coarse
fine	< 10% medium and coarse

Composite Clay Soil – A composite clay soil sample is classified by determining the smallest diameter thread that can be rolled manually.

<u>Material</u>	<u>Smallest Thread Diameter</u>	<u>Degree of Plasticity</u>
SILT	None	Nonplastic
Clayey SILT	1/4-inch	Slight
SILT & CLAY	1/8-inch	Low
CLAY & SILT	1/16-inch	Medium
Silty CLAY	1/32-inch	High
CLAY	1/64-inch	Very High

Organic Soil – An organic soil sample is classified by observation of the sample structure.

Material

- Topsoil - surficial soils that support plant life and which contain a high percentage of organic matter.
- Fibrous Peat - deposits of plant remains in which the original plant fibers are still visible.
- Amorphous Peat - deposits of plant remains in which the original plant fibers have been destroyed. Usually found underlying fibrous peat.
- Organic Silt - fine grained marine soils which have been transported due to erosion and deposited in still water below the zone of wave action. May contain shell fragments, organic odor, high sand content, nonplastic.
- Clayey Organic Silt - similar to Organic Silt, low sand content, plastic.

4.0 ADDITIONAL DETAILS AND DESCRIPTIVE TERMS

SOIL STRUCTURE – produced by deposition of sediments.

- Stratified - random soil deposits of varying components or color.
- Varved - alternating soil deposits of varying thickness (i.e. clays or silts).
- Stratum - soil deposit greater than 12 inches thick.
- Layer - soil deposit 3 inches to 12 inches thick.
- Seam - soil deposit 1/8 inch to 3 inches thick.
- Parting/lens - soil deposit less than 1/8 inch thick.

MOISTURE CONTENT

- Dry - moisture not apparent, dusty, dry to the touch.
- Moist - damp, but no visible water.
- Wet - visible free water.

5.0 UNIFIED SOIL CLASSIFICATION SYMBOL AND DESCRIPTION

CL	Lean Clay	GW	Well Graded Gravel
ML	Silt	GP	Poorly Graded Gravel
OL	Organic Silt/ Clay Low Plasticity	GM	Silty Gravel
CH	Fat Clay	GC	Clayey Gravel
MH	Plastic Silt	SW	Well Graded Sand
OH	Organic Silt/Clay High Plasticity	SP	Poorly Graded Sand
PT	Peat	SM	Silty Sand
		SC	Clayey Sand

GUIDELINES TO CLASSIFICATION AND IDENTIFICATION OF ROCK

A. WEATHERING

Fresh	Fresh rock, crystals bright, few joints, may show slight staining. Rock rings under hammer if crystalline.
Slightly Weathered	Rock generally fresh, joints stained and discoloration extends into rock up to 1 inch. Joints may contain clay or gouge. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately Weathered	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some look clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Highly Weathered	All rock is discolored or stained. In granitoid rocks all feldspars are dull and discolored and majority shows kaolinization. Rock shows severe loss of strength and can be excavated with a geologists pick. A clunking sound when struck with a hammer.
Disintegrate Rock	Rock texture clear and evident, but reduced in strength to strong soil. Some fragments of strong rock usually left.

B. FRACTURING AND BEDDING

<u>Spacing</u>	<u>Fracturing</u>	<u>Bedding and Foliation</u>
More than 3 feet	Massive	Thick
1 foot – 3 feet	Slightly Fractured	Medium
2 inches – 1 foot	Moderately Fractured	Thin
Less than 2 inches	Highly fractured	Very Thin

C. GRAIN SIZE

Fine	Visible to naked eye to 1/16-inch diameter.
Medium	1/16-inch to 1/4-inch diameter.
Coarse	Greater than 1/4-inch diameter.

D. HARDNESS

Very Hard	Cannot be scratched with a knife or sharp pick. Breaking of hand specimens requires several hard blows with a geologists pick.
Hard	Can be scratched with a knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with a knife or pick. Gouges or grooves to ¼ inch deep can be excavated with hard blows of a geologists pick. Hand specimens can be detached by a moderate blow.
Medium	Can be grooved to a 1/16-inch deep by firm pressure on a knife or pick point. Can be excavated in small chips to pieces approximately 1-inch maximum size by hard blows of the point of a geologists pick.
Soft	Can be gouged or grooved easily with a knife or pick point. Can be excavated in chips to pieces several inches in size. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with a knife. Can be excavated easily with the point of a pick. Pieces 1 inch or more in thickness can be broken with finger pressure.

E. ROCK QUALITY DESIGNATION (RQD)

<u>RQD (Percent)</u>	<u>Diagnostic Description</u>
Exceeding 90	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 – 25	Very Poor

Comments: RQD is applicable to NX core only. The diameter of an NX core is 2.16 inches. RQD is expressed as a percentage and is determined by dividing the length of the run by the total length of the recovered cores pieces measuring 4-inches or greater. Core recovery is reported as a percentage and is determined by dividing the length of the core recovered (all pieces) by the length of the run.

APPENDIX D

USGS SEISMIC DESIGN MAPS



Arlington Light Pole Foundations

25 Drake Rd, Arlington, MA 02476, USA

Latitude, Longitude: 42.4261667, -71.18773929999999



Date	11/18/2021, 1:11:49 PM
Design Code Reference Document	IBC-2015
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	0.218	MCE_R ground motion. (for 0.2 second period)
S_1	0.07	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.262	Site-modified spectral acceleration value
S_{M1}	0.119	Site-modified spectral acceleration value
S_{DS}	0.175	Numeric seismic design value at 0.2 second SA
S_{D1}	0.079	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	B	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.7	Site amplification factor at 1.0 second
PGA	0.117	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.14	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
S_{sRT}	0.218	Probabilistic risk-targeted ground motion. (0.2 second)
S_{sUH}	0.245	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
S_{sD}	1.5	Factored deterministic acceleration value. (0.2 second)
S_{1RT}	0.07	Probabilistic risk-targeted ground motion. (1.0 second)
S_{1UH}	0.078	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S_{1D}	0.6	Factored deterministic acceleration value. (1.0 second)

Type	Value	Description
PGAd	0.6	Factored deterministic acceleration value. (Peak Ground Acceleration)
C _{RS}	0.893	Mapped value of the risk coefficient at short periods
C _{R1}	0.899	Mapped value of the risk coefficient at a period of 1 s

APPENDIX B

ORDER OF CONDITIONS



TOWN OF ARLINGTON
MASSACHUSETTS
CONSERVATION COMMISSION

CERTIFIED MAIL

April 12, 2022

**Joe Connelly
Dept. of Recreation
422 Summer Street
Arlington, MA 02474**

RE: Order of Conditions for Hurd Field - DEP File Number 091-0337

Enclosed is the original Order of Conditions for the above-referenced project, issued pursuant to the Wetlands Protection Act, GL c. 131, § 40, and the Arlington Bylaw for Wetland Protection, Title V, Article 8.

No work on the project may begin until ALL of the following requirements have been satisfied:

- ☐ You have signed and returned to this office the attached Certificate of Understanding.
- ☐ The 10-business day appeal period has elapsed. The appeal period begins on the date of issuance of the Order.
- ☐ You have had the original Order recorded at the Middlesex South Registry of Deeds and the receipt forwarded to the Conservation Commission. The Order is not valid until properly recorded.
- ☐ The DEP file number sign has been erected at the project entrance, as specified in the Conditions.
- ☐ You have read and understand the enclosed Order of Conditions. Compliance with all conditions and the approved plans is the responsibility of the applicant. Deviation from the approved plans may result in a stop work order or further enforcement, as well as the inability to obtain a Certificate of Compliance.
- ☐ You have conducted a "pre-construction site visit" with the Conservation Administrator, installed erosion controls, submitted in writing the names and telephone numbers of the parties responsible for the work (such as the general contractor, erosion control monitor, field engineer, and wetland scientist), and submitted a schedule of construction, as applicable.
- ☐ Please note that there may be other specific requirements in your Order of Conditions, which may be required for your site. Please be sure to read the whole Order. It is your responsibility to comply with all aspects of the Order.

Upon completion of the project, you must submit:

- ☐ A “Request for a Certificate of Compliance” (state WPA form 8a) and
- ☐ An engineer-stamped and signed as-built plan to the Conservation Commission stating that all conditions have been satisfactorily completed in compliance with the plans and the Order.
- ☐ Once received, your Certificate of Compliance must be recorded at the Middlesex South Registry of Deeds, and the receipt sent to the Conservation Office (as per the Wetlands Protection Regulations).

Please contact our office with any questions at 781-316-3012 or email concomm@town.arlington.ma.us.

Thank you,

David Morgan
Environmental Planner + Conservation Agent

Enclosures: Order of Conditions
 Certificate of Understanding

CC: File
 DEP-NERO



TOWN OF ARLINGTON
MASSACHUSETTS
CONSERVATION COMMISSION

CERTIFICATE OF UNDERSTANDING

RE: Conditions and Restrictions in Wetland Resource Areas, Buffer Zones, and Regulatory Floodways

Street Address:

DEP File No:

Owner:

Issue Date:

I, _____, owner of _____, Arlington, Massachusetts, do hereby acknowledge and understand that:

<ul style="list-style-type: none">• All or some of my property lies within wetland resource areas such that any new work within this area is subject to review and approval by the Conservation Commission;	_____ Initials
<ul style="list-style-type: none">• I, as property owner, am responsible for all work on my property even if it is conducted by contractors;	_____ Initials
<ul style="list-style-type: none">• I have received, read and understand all the general and special conditions contained in the referenced Order of Conditions;	_____ Initials
<ul style="list-style-type: none">• There are specific requirements PRIOR to the start of work which I agree to follow;	_____ Initials
<ul style="list-style-type: none">• There are specific requirements DURING construction and work which I agree to follow;	_____ Initials
<ul style="list-style-type: none">• There are specific requirements for getting a Certificate of Compliance once all permitted work is completed; and	_____ Initials
<ul style="list-style-type: none">• There are a number of ongoing/perpetual conditions that restrict the kind of landscaping and maintenance activities allowed within wetland resource areas and/or buffer zones.	_____ Initials

I have carefully reviewed and understand all of these requirements and agree to adhere to them.

Signature

Printed Name

Date



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0337

MassDEP File #

eDEP Transaction #

Arlington

City/Town

A. General Information

Please note:
this form has
been modified
with added
space to
accommodate
the Registry
of Deeds
Requirements

Important:
When filling
out forms on
the
computer,
use only the
tab key to
move your
cursor - do
not use the
return key.



1. From: Arlington
Conservation Commission

2. This issuance is for (check one):
a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Joseph

a. First Name

Connelly

b. Last Name

Town of Arlington

c. Organization

422 Summer Street

d. Mailing Address

Arlington

e. City/Town

MA

f. State

02474

g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

5. Project Location:

0 Massachusetts Ave & 0 Lowell Street

a. Street Address

Arlington

b. City/Town

Map 61

c. Assessors Map/Plat Number

Lots 1-3 and 1-4

d. Parcel/Lot Number

Latitude and Longitude, if known:

d m s
d. Latitude

d m s
e. Longitude



Massachusetts Department of Environmental Protection
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A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Middlesex

a. County

5255 (for both Map 61-1-3 & Map 61-1-4)

c. Book

b. Certificate Number (if registered land)

102 (for both Map 61-1-3 & Map 61-1-4)

d. Page

7. Dates: 01/06/2022 03/03/2022 04/08/2022
a. Date Notice of Intent Filed b. Date Public Hearing Closed c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

SEE ATTACHMENT

a. Plan Title

b. Prepared By

c. Signed and Stamped by

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

- a. ☐ Public Water Supply b. ☐ Land Containing Shellfish c. ☒ Prevention of Pollution
d. ☐ Private Water Supply e. ☒ Fisheries f. ☒ Protection of Wildlife Habitat
g. ☒ Groundwater Supply h. ☒ Storm Damage Prevention i. ☒ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

- a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



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B. Findings (cont.)

Denied because:

- b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	<u> </u> a. linear feet	<u> </u> b. linear feet	<u> </u> c. linear feet	<u> </u> d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
6. <input type="checkbox"/> Land Under Waterbodies and Waterways	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
	<u> </u> e. c/y dredged	<u> </u> f. c/y dredged		
7. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	42,022	42,022	42,022	42,022
	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
Cubic Feet Flood Storage	<u> </u> e. cubic feet	<u> </u> f. cubic feet	24408	24408
			<u> </u> g. cubic feet	<u> </u> h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	<u> </u> a. square feet	<u> </u> b. square feet		
Cubic Feet Flood Storage	<u> </u> c. cubic feet	<u> </u> d. cubic feet	<u> </u> e. cubic feet	<u> </u> f. cubic feet
	129, 106	129, 106		
9. <input checked="" type="checkbox"/> Riverfront Area	<u> </u> a. total sq. feet	<u> </u> b. total sq. feet		
Sq ft within 100 ft	65, 365	65, 365	57,380	57, 380
	<u> </u> c. square feet	<u> </u> d. square feet	<u> </u> e. square feet	<u> </u> f. square feet
Sq ft between 100-200 ft	63, 741	63, 741	54, 192	54, 192
	<u> </u> g. square feet	<u> </u> h. square feet	<u> </u> i. square feet	<u> </u> j. square feet



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B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input type="checkbox"/> Land Under the Ocean	<u> </u> a. square feet	<u> </u> b. square feet		
	<u> </u> c. c/y dredged	<u> </u> d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. nourishment	<u> </u> d. nourishment
14. <input type="checkbox"/> Coastal Dunes	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. nourishment	<u> </u> d. nourishment
15. <input type="checkbox"/> Coastal Banks	<u> </u> a. linear feet	<u> </u> b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	<u> </u> a. square feet	<u> </u> b. square feet		
17. <input type="checkbox"/> Salt Marshes	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	<u> </u> a. square feet	<u> </u> b. square feet		
	<u> </u> c. c/y dredged	<u> </u> d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	<u> </u> a. c/y dredged	<u> </u> b. c/y dredged		
21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	<u> </u> a. square feet	<u> </u> b. square feet		
22. <input type="checkbox"/> Riverfront Area	<u> </u> a. total sq. feet	<u> </u> b. total sq. feet		
Sq ft within 100 ft	<u> </u> c. square feet	<u> </u> d. square feet	<u> </u> e. square feet	<u> </u> f. square feet
Sq ft between 100-200 ft	<u> </u> g. square feet	<u> </u> h. square feet	<u> </u> i. square feet	<u> </u> j. square feet



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B. Findings (cont.)

* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. ☐ Restoration/Enhancement *:

a. square feet of BVW

b. square feet of salt marsh

24. ☐ Stream Crossing(s):

a. number of new stream crossings

b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
 - a. The work is a maintenance dredging project as provided for in the Act; or
 - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
 - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 04/08/2025 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.



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C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]
 "File Number 091-0337 "
11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.



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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.
19. The work associated with this Order (the "Project")
 - (1) ☐ is subject to the Massachusetts Stormwater Standards
 - (2) ☒ is NOT subject to the Massachusetts Stormwater Standards

If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
 - i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
 - ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
 - iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;



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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- g) The responsible party shall:
 - 1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 - 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 - 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

SEE ATTACHMENT

- 20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.



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D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No
2. The Arlington hereby finds (check one that applies):
 Conservation Commission

- a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

1. Municipal Ordinance or Bylaw

2. Citation

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

- b. ☒ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

Arlington Wetlands Protection Bylaw

Title V, Art.

1. Municipal Ordinance or Bylaw

8

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

SEE ATTACHMENT



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E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

1. Date of Issuance

Please indicate the number of members who will sign this form. This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

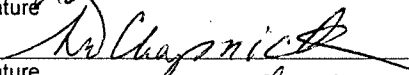
The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signature 

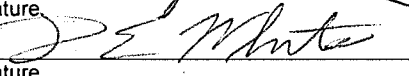
Printed Name David S. Kaplan

Signature 

Printed Name Nathaniel C. Stevens

Signature 

Printed Name Susan D. Chapnick

Signature 

Printed Name David A. White

Signature

Printed Name

Signature

Printed Name

Signature

Printed Name

Signature

Printed Name

☐ by hand delivery on

☒ by certified mail, return receipt requested, on

Date

04.12.22

Date



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F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



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G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Arlington

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Arlington

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

0 Massachusetts Ave & 0 Lowell St

Project Location

091-0337

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

for:

Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number: _____

**Request for Departmental Action Fee
Transmittal Form**

Provided by DEP _____

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address _____

b. City/Town, Zip _____

c. Check number _____

d. Fee amount _____

2. Person or party making request (if appropriate, name the citizen group's representative):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

4. DEP File Number: _____

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- ☐ Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- ☐ Superseding Determination of Applicability – Fee: \$120
- ☐ Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number: _____

**Request for Departmental Action Fee
Transmittal Form**

Provided by DEP _____

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

ARLINGTON CONSERVATION COMMISSION
ORDER OF CONDITIONS 0 MASSACHUSETTS AVENUE DEP FILE NO. 091-0337
 & 0 LOWELL STREET

DOCUMENTS REVIEWED

0 MASSACHUSETTS AVENUE

DEP FILE NO. 091-0337

DOCUMENTS REVIEWED

1. Hurd Field Notice of Intent, Arlington, MA, prepared by Stantec, for the Applicant: Town of Arlington, Joe Connelly, dated January 6, 2022, revised January 27, 2022. Appendices include: (A) Stormwater Management Checklist and Memorandum, (B) Abutter Notification Information, (C) Request for Variance, (D) Photo Sheets, (E) Project Plans.
2. Stormwater Management Memorandum, prepared by Karen Beighley (Stantec), dated January 5, 2022.
3. Variance Request seeking relief from Section 25 of the Arlington Wetland Regulations for work in 25-foot Adjacent Upland Resource Area (AURA).
4. Hurd Field NOI Permit Plan Set, prepared by Stantec, stamped by Joshua Atkinson RLA #3012, dated January 6, 2022.
5. Hurd Field Supplemental Memo, Design Revisions per Conservation Commission Request from January 20, 2022, NOI Hearing, prepared by Stantec, dated January 27, 2022. Attachments include: (1) Revised drawing set labeled “Town of Arlington Hurd Field Renovations Notice of Intent Updates”, dated 1/27/2022, (2) Specification Sheet for New England Conservation/ Wildlife Seed Mix, (3) Specification Sheet for Low-Growing Meadow Mix, (4) Response to 310 CMR 10.58 (5) standards for redevelopment within the Riverfront Area, (5) Photometric Plan and field lighting cut sheets, (6) Rendering Site Plan.
6. Hurd Field Supplemental Memo, Design Revisions per Conservation Commission Request from February 3, 2022, NOI Hearing, prepared by Stantec, dated February 9, 2022. Attachments include: (1) Revised drawing: “Materials Plan”, dated 2/9/2022, (2) Revised drawing: “Planting Plan”, dated 2/9/2022, with updated RFA calculations, (3) Revised Rendered Site Plan, (4) Operations and Maintenance Plan.
7. Modification to NOI for Arlington Reservoir (DEP #091-0327), submitted by KZLA on February 28, 2022, including existing conditions photos, and plans SKL-9 and SKL-10.
8. Correspondence between Chuck Tirone, Arlington Conservation Commission, and Joy Duperault, State NFIP Coordinator/Director, Flood Hazard Management Program, MA Dept. of Conservation & Recreation, dated March 3, 2022, concerning plantings in floodway and flood plains.
9. Hurd Field Supplemental Memo, Design Revisions per Conservation Commission Request from February 17, 2022, NOI Hearing, prepared by Stantec, dated March 10, 2022. Attachment includes: Revised Rendered Site Plan dated March 10, 2022.

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PROCEEDINGS

The Notice of Intent was filed on January 6, 2022. The Conservation Commission opened the public hearing for the Notice of Intent on January 20, 2022. The hearing was continued with the Applicant's consent to February 3, 2022, again to February 17, 2022, and to March 17, 2022. On February 28, 2022, KZLA submitted a request to add the bridge connection from Hurd Field to the Arlington Reservoir perimeter trail to the Order of Conditions for Arlington Reservoir (DEP #091-0327). The Commission voted to instead move the amendment to the Hurd Field Notice of Intent. The Commission voted 6-0 to close the public hearing on March 17, 2022 and deliberated on conditions. The Commission requested and was granted the Applicant's permission to postpone issuance of the Order of Conditions until April 11, 2022, to deliberate further on the special conditions. The Commission then reviewed permit conditions on April 7, 2022, and voted 6-0 to approve the Project with conditions under the Wetlands Protection Act (the "Act") and voted 6-0 to approve the Project with conditions under the Arlington Wetlands Protection Bylaw (the "Bylaw").

**FINDINGS OF FACT AND LAW
UNDER ARLINGTON WETLANDS PROTECTION BYLAW
AND WETLANDS PROTECTION ACT**

- A. This project as approved involves improvements to Hurd Field through the following activities: demolition and removal of existing structures and features (baseball backstops, infield mix, storage shed), construction of a new baseball/softball field and two new soccer fields, grading to avoid standing water and to direct runoff from south to north toward a low point retention area, installation of amenities (benches, bike rack, picnic tables, overlook with seating, spectator seating area, team benches, light poles), development of a porous asphalt pedestrian loop path, and Riverfront mitigation measures described at Finding C.
- B. Hurd Field is a 27.38-acre public recreational park located in Arlington Heights, adjacent to Arlington Reservoir. The field is located on two parcels. The ballfield parcel is located at 0 Massachusetts Avenue (6.14 acres) and the north parcel is at 0 Lowell Street (21.24 acres). The project site is bordered by Arlington Reservoir to the north, Mill Brook to the east, the Minuteman Bikeway to the south, and private to the west. Mill Brook flows west to east next to the site, then makes an abrupt turn into a concrete channel that directs it south. The existing banks of the brook are not armored on the east-west course.
- C. The project includes approximately 360,690 square feet of Riverfront Area, of which 57,760 is degraded. As approved, the project will alter 129,106 square feet of Riverfront Area, 65,365 square feet of which is within the inner riparian zone and 63,741 square feet of which is between 100-feet and 200-feet. There are 57,760 existing square feet of degraded Riverfront Area. The new permanent alteration totals 17,534 square feet; the remainder will be temporary. Approximately 42,022 square feet of Bordering Land Subject to Flooding will be altered and replaced. The volume of flood storage will be 904 cubic yards more than existing conditions. In addition to increasing flood storage, mitigation for work in the Riverfront Area includes construction of a bioretention basin, forebay, and vegetated swale adjacent to the parking lot,

coir log bank restoration in two locations along Mill Brook, establishment of a no-mow meadow flanking the northern section of the loop path, native plantings of 26 new trees and 85 low shrubs, and removal of invasive knotweed along northeast segment of Mill Brook.

- ## CONCLUSION

For the foregoing reasons, the Commission approves this project under the Act and Bylaw with the conditions stated herein the applications for work at 0 Massachusetts Avenue and 0 Lowell Street (Hurd Field).

In addition to the General Conditions (numbered 1 – 20 above), the Project is subject to the following Additional Special Conditions (under both the Act and Bylaw) only for those portions of the project within the Conservation Commission's jurisdiction:

21. Before work begins, the Applicant shall submit to the Conservation Commission for approval plans for a bioretention basin, forebay, and vegetated swale at the northeast parking lot corner.

ARLINGTON CONSERVATION COMMISSION
ORDER OF CONDITIONS 0 MASSACHUSETTS AVENUE DEP FILE NO. 091-0337
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22. Before work begins, the Applicant shall submit to the Conservation Commission for approval an Operations and Maintenance Plan for Hurd Field, to include, at minimum, maintenance of the porous pavement path, the infiltration system described at condition #21, and the bank stabilization and restoration areas detailed in reviewed document #7, as well as fertilizer use.
23. Work permitted by this Order and Permit shall conform to the Notice of Intent, the approved plans and documents (listed above), and oral representations (as recorded in hearing minutes) submitted or made by the Applicant and the Applicant's agents or representatives, as well as any plans and other data, information or representations submitted per these Conditions and approved by the Commission.
24. The provisions of this Order and Permit shall apply to and be binding upon the Applicant and Applicant's assignees, tenants, property management company, employees, contractors, and agents.
25. If there are conflicting conditions within this Order, the stricter condition(s) shall govern.
26. No work shall begin under this Order until: (a) all other required permits or approvals have been obtained and (b) the appeal period of ten (10) business days from the date of issue of this Order has expired without any appeal being filed, and (c) this Order has been recorded in the Registry of Deeds. No work shall be started under this Permit until all other necessary permits or approvals have been obtained.
27. The Applicant shall ensure that a copy of this Order of Conditions and Permit for work, with any referenced plans, is available on site at all times, and that all contractors, site managers, foremen, and sub-contractors understand its provisions.
28. Prior to starting work, the Applicant shall submit to the Commission the names and 24-hour phone numbers of project managers or the persons responsible for site work or mitigation.
29. Before work begins, erosion and sediment controls shall be installed at the limits of the work area. These will include a silt fence and minimum 12-inch compost filter sock around the entire work area (hay bales are not allowed).
30. Prior to any work commencing, a sign no less than 2 square feet or more than 3 square feet, visible from the street, shall be displayed reading "MA DEP File # 091-0337" and not placed on a living tree.
31. The contractor shall contact the Conservation Agent (concomm@town.arlington.ma.us ; 781-316-3012) to arrange for a pre-construction meeting with the onsite project manager to walk through the Order of Conditions and walk the site to confirm the installation and placement of erosion controls prior to the start of any grading or construction work.
32. The contractor shall provide written Notice of the work start date to the Conservation Agent 48 hours prior to start of work.

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33. The Commission, its employees, and its agents shall have the right of entry onto the site to inspect for compliance with the terms of this Order of Conditions and Permit until a Certificate of Compliance has been issued.

II. POST-CONSTRUCTION

34. When requesting a Certificate of Compliance, the Applicant shall provide a written statement by a registered professional engineer certifying substantial compliance with the plans and setting forth what deviation, if any, exists from the plans approved in the Order shall accompany the request for a Certificate of Compliance; the Applicant shall also provide at that time as-built plans stamped by such a professional.
35. The Applicant shall submit a snow storage plan to the Commission for review. No snow storage is permitted within any resource areas. **This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

III. DURING CONSTRUCTION

Dumpsters

36. No dumpsters shall be allowed within the 100-foot Buffer Zone or Adjacent Upland Resource Areas (“AURA”) or other Resource Areas.

Stockpiling

37. No uncovered stockpiling of materials shall be permitted within the 100-foot Buffer Zone or Adjacent Upland Resource Areas (“AURA”) or other Resource Areas.

Erosion Control

38. Areas that are disturbed by construction and access activities shall as soon as possible be brought to final grade and reseeded and restabilized and shall be done so prior to the removal of erosion control barriers.

39. Erosion control measures shall be installed per the approved plans.

Equipment

40. No heavy equipment may be stored overnight within 50 feet of the brook and no refueling or maintenance of machinery shall be allowed within the 100-foot Buffer Zone, Adjacent Upland Resource Area, or within any Resource Area.

Sweeping and Dust Management

41. During construction, any dirt or debris spilled or tracked onto any paved streets shall be swept up and removed daily.

42. Regular sweeping of the walkways shall be conducted as indicated in the Operations & Maintenance Plan submitted with reviewed document #6 (Section 3.1.1).

43. The Applicant shall ensure that dust and water resulting from work on the Reservoir bridge is captured and disposed of offsite, not allowed to enter Mill Brook.

Dewatering

44. Any dewatering operations shall conform to the following:
- (a) Notify the Conservation Commission that dewatering is required.
 - (b) Any catch basins, drains, and outfalls to be used in dewatering operations shall be cleaned out before operations begin.
 - (c) Any water discharged as part of any dewatering operation shall be passed through filters, on-site settling basins, settling tank trucks, or other devices to ensure that no observable sediments or pollutants are carried into any Resource Area, street, drain, or adjacent property.
 - (d) Measures shall be taken to ensure that no erosion or scouring shall occur on public or private property, or on the banks or bottoms of water bodies, because of dewatering operations.

Plantings

45. All plantings within resource areas and the buffer zone shall be native and be installed and maintained according to the standards of the American Association of Nurserymen (AAN). No cultivars of native plantings shall be allowed. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**
46. All plantings planted and invasive species removed through this project shall be monitored for three growing seasons (three years counted from planting season). A survival rate of 100% for trees and at least 80% for shrubs must be maintained for the approved plantings at the end of the third monitoring year. If these survival rates are not met after the third growing season, the Applicant must submit recommendations for replacements to the Conservation Agent for approval. A monitoring report shall be submitted annually in June for the three-year monitoring period, reporting on the health of the new plantings and the success of the invasive plant management.
47. The Applicant shall protect all area trees per the Town Wetlands Protection Regulations, Section 24 Vegetation Removal and Replacement, protecting trees through securing (not nailing) 2x4 boards, between 6-8 feet in length, around tree base. The boards shall be installed vertically such that one end is installed directly into the ground. Alternative protection measures must be approved by the Commission or its agent.
48. The Applicant shall remove sufficient soil, dug to a depth of 2 feet, from the eastern portion of the loop path construction area as to unearth the stand of knotweed located there and remove its root system. The knotweed and affected soil shall be properly disposed of.

Chemicals

49. To avoid adding excess nutrient runoff, the Applicant shall only treat the mitigation areas with no-phosphorous, slow-release nitrogen fertilizer. Application of this fertilizer cannot occur in

the summer, or before, during, or immediately after storm events. Field fertilizer application shall be reviewed and approved by the Conservation Commission, as submitted with the Operations & Maintenance Plan listed in Special Condition #22.

50. No other herbicides or treatment methods are approved unless otherwise noted in this order. New plantings shall only be fertilized once, during the initial planting year. No pesticides or rodenticides shall be used to treat pest management issues with the 100-ft wetlands buffer, AURA, or other resource areas. **This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

Pervious Surfaces

51. Pervious surfaces shown on the project plans shall be maintained and not be replaced by impervious surfaces. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**
52. All porous asphalt surfaces shall be inspected annually for signs of deterioration. The efficiency of the porous asphalt shall be monitored as needed following storm events. The exfiltration capability shall be assessed at least once per year. If cleaning is required, it shall be performed using a power washer to dislodge trapped particles followed by a vacuum sweep of the area.

Mitigation

53. All mitigation as proposed as part of this project shall remain in perpetuity. Replacement of the approved bank stabilization and restoration areas, planting areas, invasive removal areas, porous asphalt, no-mow zone, and bioretention basin shall be subject to the approval of the Commission. **This shall be a continuing condition that survives the expiration of this permit /Order and shall be included in any Certificate of Compliance as a continuing condition in perpetuity.**

